No.01

Oki Data CONFIDENTIAL

MICROLINE 390FLATBED PRINTER
Maintenance Manual

(OEL/INT)

[Rev. 3]

Related drawings

Drawing No.	Name
42804301TL	ML390FLATBED Disassembly for Maintenance
42804301TR	ML390FLATBED RSPL

BOM / Use for / Certification Body

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2	2007-05-24	SW4-0500	Change for RoHS	Minoru Kanno	Minoru Kanno
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PREFACE

This maintenance manual describes field maintenance of the MICROLINE 390FLATBED printer and options for maintenance engineers.

For performance specifications and operating procedures, refer to the "User's Manual".

CONTENTS

1. CONFIGURATION

1.1. Standard Printer Configuration

The standard configuration of the ML390FLATBED is as follows.

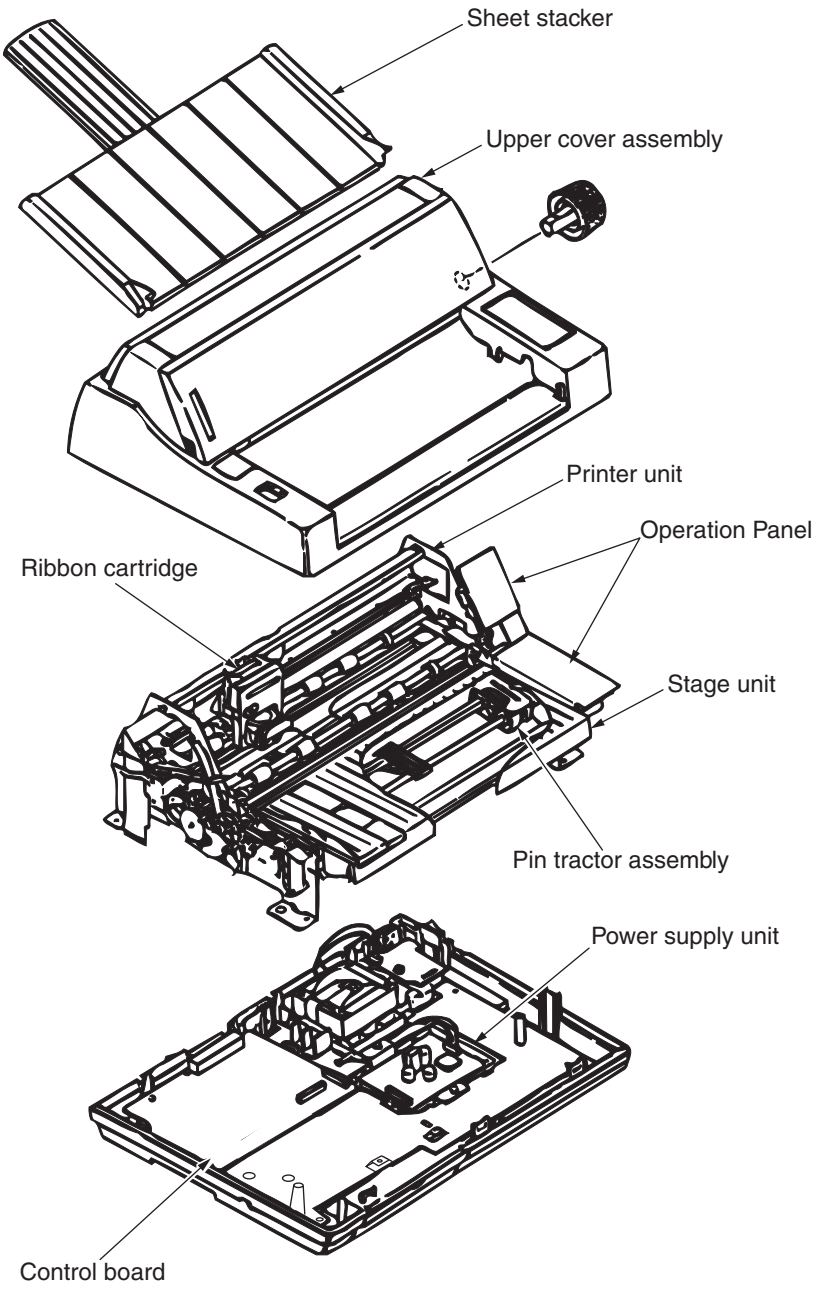
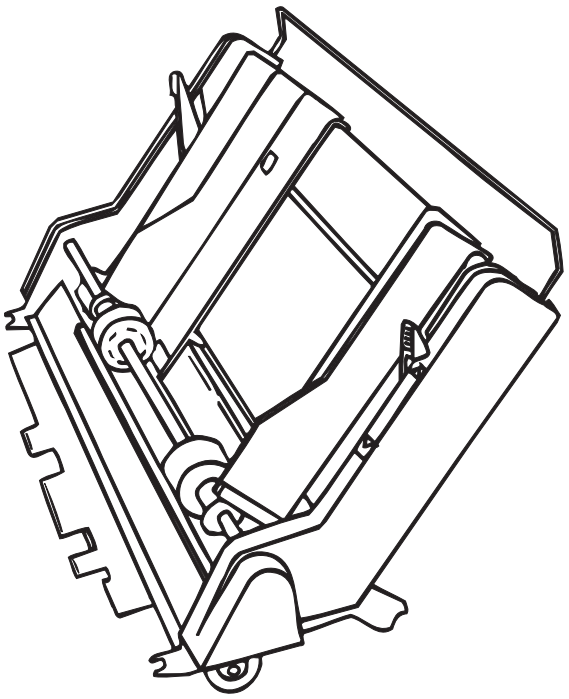


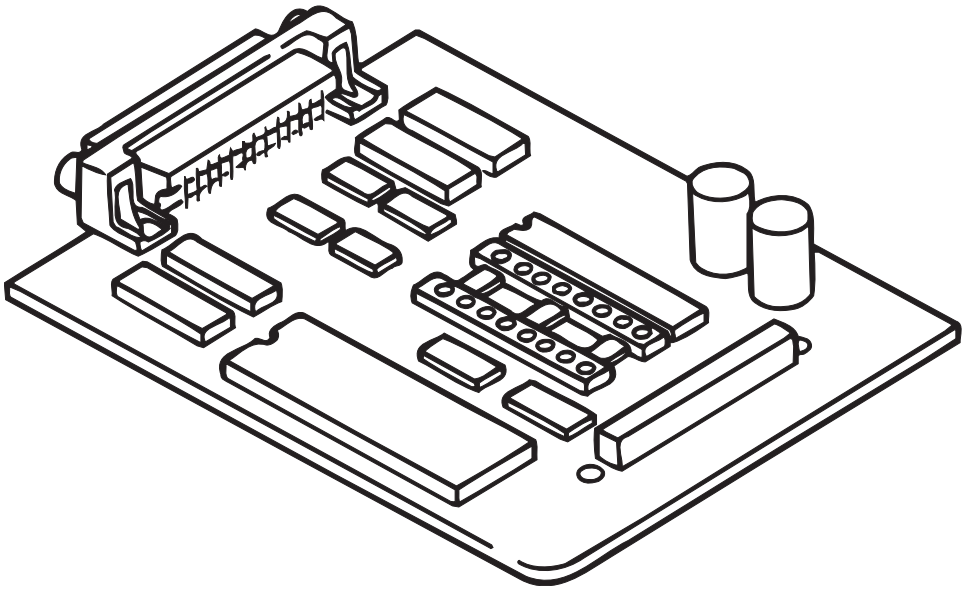
Figure 1-1 Printer configuration

1.2 Options

(1) Cut-sheet feeder unit



(2) RS-232C serial interface board



2. THEORY OF OPERATION

2.1 Electrical Operation

This section describes the electrical operation of the printer circuits.

2.1.1 General

The block diagram of the printer circuit is shown in Figure 2-1.

The control board consists of the microprocessor and its peripheral circuits, the drive circuits, sensor and switch detect circuits and interface connectors.

The power to the control board is provided from the power supply board via the connector cord.

The power to the other electrical parts is distributed via the connectors in the control board.

2.1.2 Microprocessor and its peripherals circuits.

(1) Microprocessor (03B : 80C154)

The microprocessor is the nucleus of the control circuit. Its peripheral circuits operate under program control by this microprocessor. The I/O ports of the microprocessor are connected to the address bus, data bus, and control lines.

(2) Program ROM (03A)

The program ROM contains the control program for the printer. The microprocessor operates by execution of this control program.

(3) RAM (03E and 03D)

The RAM stores data such as print data which has been received.

(4) LSI (MSM6990) (02B)

The MSM6990 is an external interface and motor control LSI. It has the following functions:

A : External interface controller

(a) Parallel interface function

The parallel interface function mode is selected when the level of the mode selection signal (ISEL) is high. In this mode, IFD1 to IFD8 are used as an input port; the parallel data received through the interface connector is latched in synchronization with the strobe signal (STB) and is sent to the CPU in synchronization with the RD signal. In this mode, the MSM6990 also sends BUSY, ACK, PE and SELECT signals to the parallel interface connector in synchronization with the WR signal.

(b) Serial interface function

Serial data received by the serial interface board is converted into 8-bit parallel data on the serial board. The converted data is stored as the MSM6990 IFD1 to IFD8 signals in synchronization with the STROBE signal from the serial board and SELECT, PE, and BUSY signals from the main board.

(c) I/O ports

The MSM6990 has a 12-bit output port and a 10-bit input port. It sends control signals in accordance with the commands from the microprocessor.

The input port is also used to read information from the operation panel switches, etc.

(d) Address latch

The address latch latches the low-order 8 bits of the address bus (A0 to A7). These bits are used as an address for read/write operations with peripheral devices. Latching of (A0 to A7) is necessary because these 8 bits are also used as the data bus.

B : Motor controller

(a) Spacing speed control function

This function accelerates and decelerates the spacing motor in accordance with commands from the microprocessor and controls the spacing motor speed in each printing mode.

(b) Dot timing generation function

This function generates the dot-on timing signal (IPT), synchronized with the printing speed in accordance with output signals (PHASE A, B) of the encoder disk on the spacing motor, and sends this timing information to the microprocessor.

(5) CGROM (01D)

The resident character fonts are stored in the character generator.

(6) EEPROM (02A)

This 256-bit serial data electrically erasable and programmable ROM stores the menu mode data.

(7) LSI (MSM79H097) (03C)

The MSM79H097 controls the DMA, head drive and LF microstep. The details are described below.

(a) DMA control

Data transfers from ROM to D-RAM or between D-RAMs is performed by DMA transfer eliminating the need of the CPU to perform such operations.

By setting the address of the transfer origin, the transfer destination and the number of bytes to be transferred and starting from the CPU, data in memory can be transferred directly.

(b) Head drive control

Drive pulses are produced for impact timing of the head using IPT signals as triggers. IPT signals are generated by phase A and B signals from the spacing motor.

The pulse width of this drive differs according to the number of the impact pins. Its duration can be preset by the CPU.

(c) Print data transfer control

Performs the serial transfer control of print data.

Print data will be transferred automatically from the memory area stored for decoding to the register in this LSI in synchronization with an IPT signal coming from MSM6990.

The data which is stored in the register will be transferred to the head drive unit as serial data just before the next impact timing.

(d) LF micro step control

Performs micro step control to enable fine feed of the LF motor.

(e) Memory interface

This function expands the memory space for ROMs and RAMs which are connected to this LSI, and makes it possible for the memory to access 368 Kbytes.

(f) D-RAM refresh

Performs refreshing of D-RAMs using the CAS before RAS refresh method.

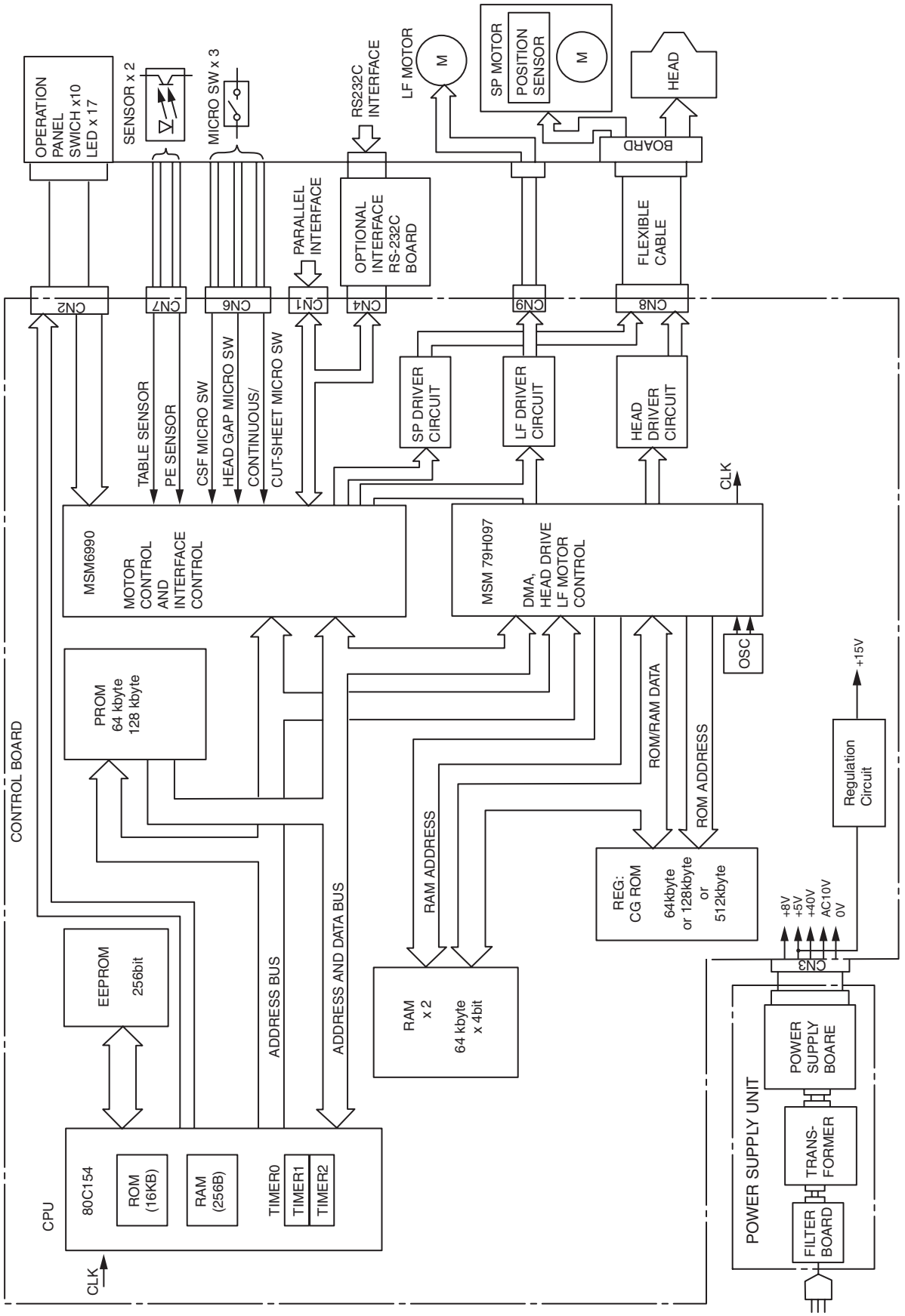


Figure 2-1 Block diagram

2.1.3 Initialization

The printer is initialized when the power is turned on or when the parallel interface signal, I-PRIME, is received from the host computer.

Initialization is started when the RST OUT 1 signal is sent from the reset circuit (02F pin 1) to 02B, and RST OUT-P is sent from 02B to 03B and 03C. BUSY signal is active during initialization stage.

When reset is completed, ROM program execution starts with mode setting of 02B, 03B and 03C.

Next a memory (ROM and RAM) check is performed, RAM is initialized, and the carriage is homed. The program finally establishes the interface signals (output level of ACK signal, BUSY signal, etc.), lights the SELECT indicator, and informs the host computer that the printer is ready for data reception (in the data reception wait state), thus completing the initialization.

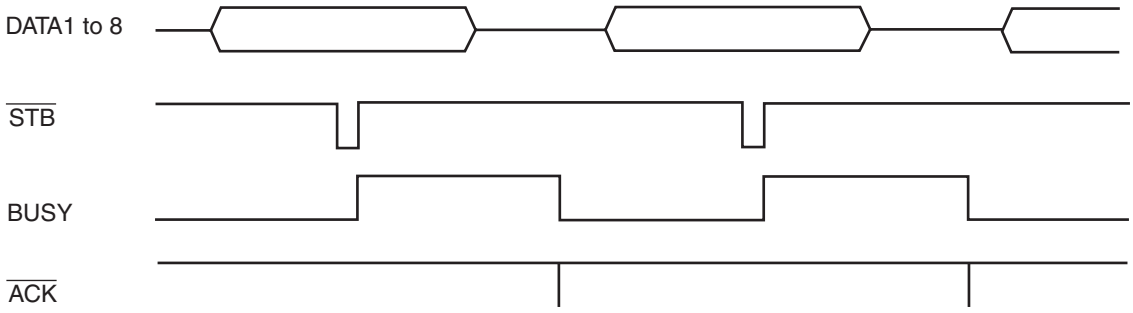
2.1.4 Interface control

(1) Parallel interface

The data from the interface is input through connector (CN1), and the interface LSI (02B : MSM6990) latches this input data in sync with the STB signal.

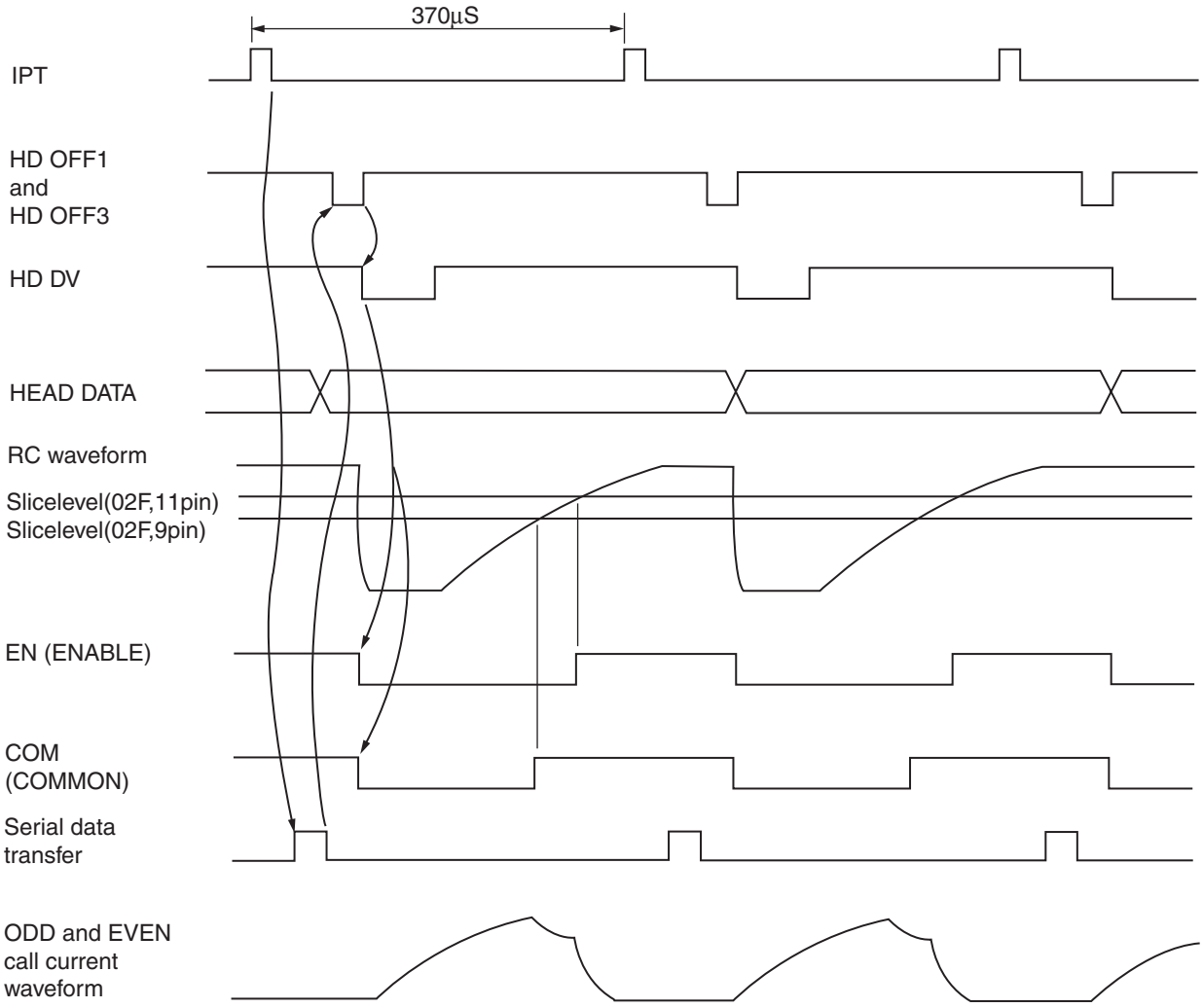
The BUSY signal is on during processing of this data. When the processing is completed, the BUSY signal is turned off, and an ACK signal is sent to request more data.

The BUSY signal is also on when data cannot be received (When the receiving buffer is full, etc).



2.1.5 Printhead drive circuit

This circuit is used to drive the head magnets corresponding to the HEAD DATA 1 to 24 (the head pins) by the HD DV signal (even or odd trigger) for printing purposes. When the HD DV signal is at "L" level, the head driving time is determined by the HD DV pulse width. This pulse is developed by a RC circuit within the IC. The pulse width of HD DV varies with the number of pins being driven. The drive time is lengthened if a larger number of pins are to be driven, but shortened if less pins are to be driven.



2.1.6 Spacing operation

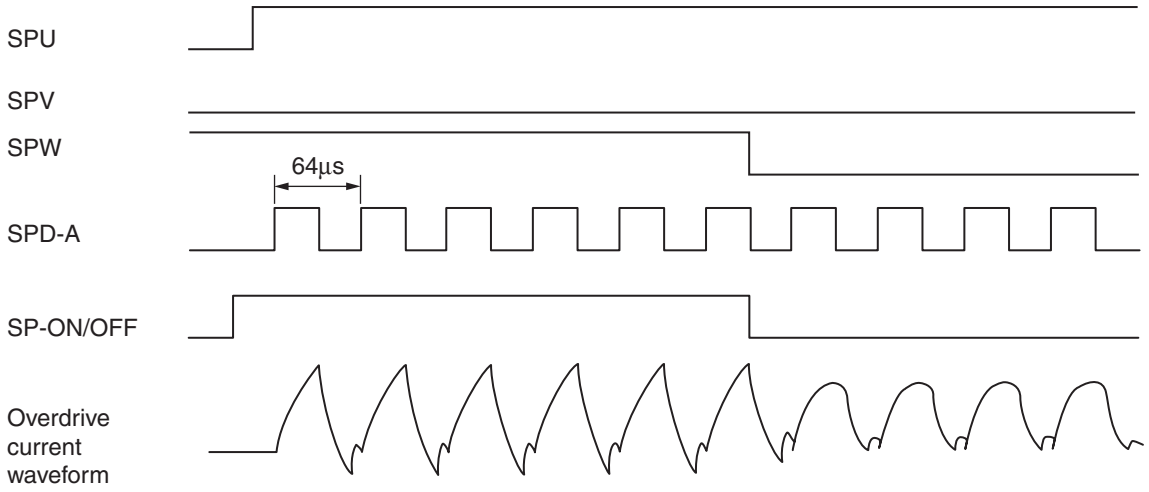
(1) Spacing motor control

The motor control LSI (02B : MSM6990) outputs the spacing motor phase signals (SPU, SPV, and SPW) in accordance with the spacing command from the microprocessor, and at the same time outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal. The pulse width is controllable by the program, and is used to control the motor drive time.

The SP ON/OFF signal is used to control acceleration and deceleration motor torque.

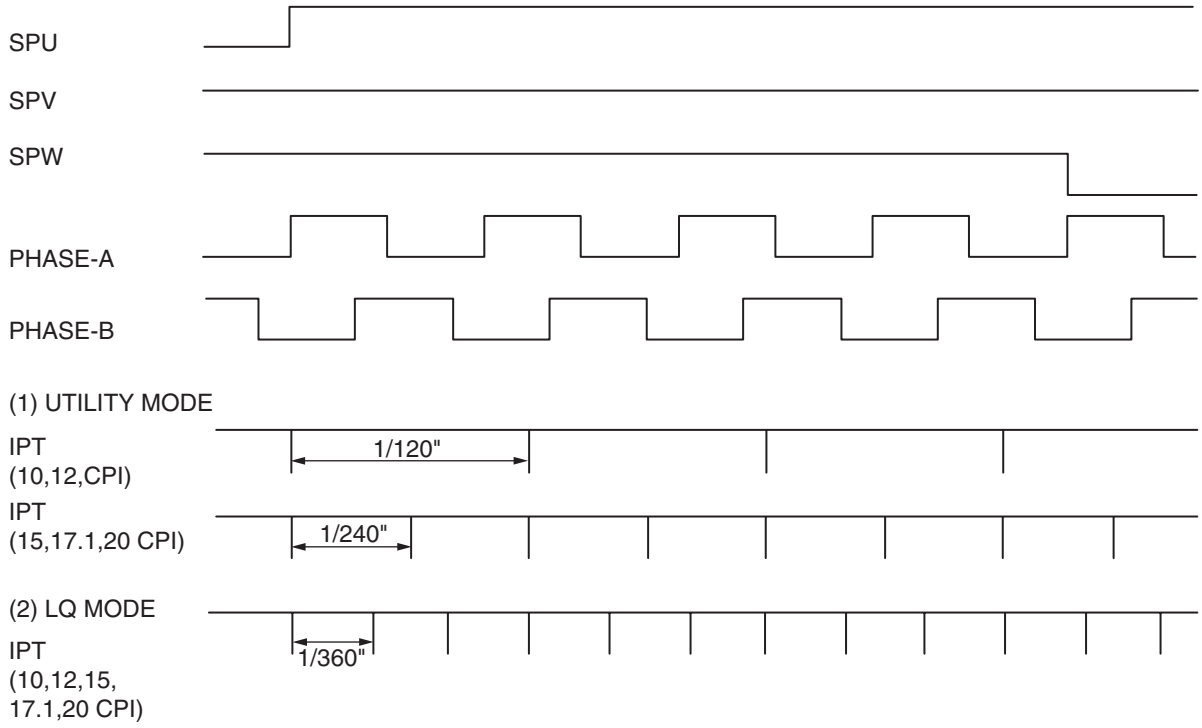
The motor driver (MTDV) drives the spacing motor in accordance with these signals. Pins 19 of the MTDV are for the protection circuits against overcurrent.



(2) Encoder disk

In the operation of the spacing motor, the PHASE-A and PHASE-B signals are generated. When the encoder disk interrupts the photo sensor.

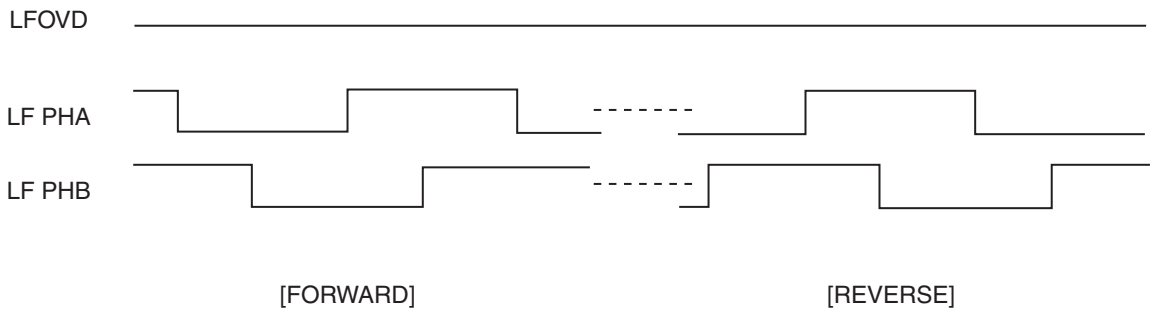
The motor control LSI (02B : MSM6990) divides these edge pulse signals in accordance with the print pitch, and sends the IPT signal to provide dot-on timing and carriage position detection timing.



2.1.7 Line feed operation

The line feed motor shaft is held stationary by the LF HOLD signal (holding current : approx. 25 mA) while it is at a stopped position.

During line feed operation, the line feed motor is driven by a large current supplied in accordance with LF OVD signal.



2.1.8 Alarm circuits

(1) Fault alarm circuit (in Power Supply Unit)

This is a protective circuit which causes the AC fuse to open when a fault occurs in the printhead drive circuit, space motor drive circuit, or their peripheral circuits, thus preventing component failure.

For this purpose, this circuit monitors the drive time using the HDALM signals interlocked with the overdrive signal of each drive circuit. If the drive time of any drive circuit exceeds the specified time, the drive circuit fault alarm circuit sends an ALM signal (high) to turn on the SCR (on the PSU).

This causes the secondary coil (40 V) of the transformer to be short-circuited, causing an overcurrent to flow through the primary coil and making the AC fuse open.

(2) Printhead overheat alarm circuit

In order to protect the printhead coils, this circuit monitors the printhead temperature by using the thermistor which is built into the printhead.

If heavy-duty printing is performed continuously for a long time, the printhead temperature increases.

The timing and types of alarms and printing actions with respect to printhead temperature and as shown in the following.

Printing Mode	1st Alarm	2nd Alarm	2rd Alarm	Others
Bit IMAGE	3 PASS print	P.H. stop (See Note 5.)	3 PASS print	Normal print
Other (characters)	Uni-direction print	P.H. stop	Uni-direction print	Normal print

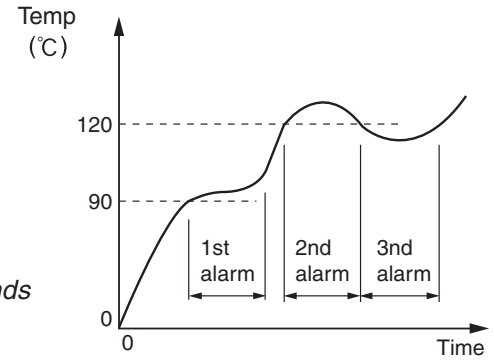
Note 1. *1st Alarm:* *For several tens seconds after printhead temperature has exceeded 90˚C for the first time.*

Note 2. *2nd Alarm:* *For the period during which printhead temperature is higher than 120˚C.*

Note 3. *3rd Alarm:* *For several tens seconds after printhead temperature fallen below 120˚C.*

Note 4. *3 PASS Print:* *Each line is printed out being divided into three cycles--with 8 dots for each cycle.*

Note 5. When approximately 20 seconds has elapsed after halting, 3 PASS printing in uni-direction starts.



Alarm detection is performed as follows:
When the temperature in the printhead increases, the resistance of the thermistor decreases and the voltage at the comparator (01B) positive input decreases to invert the comparator output, causing the HEAD TEMP signal to be sent to the motor control LSI.

2.1.9 Paper end detection circuit

When no paper is installed or an end of paper condition exists, the photo-sensor (PE) on the sensor board is turned off changing the PAPER END signal to a low level. This signal is fed to pin 55 of the motor control LSI (02B), which causes the printing operation to halt and the ALARM indicator to illuminate.

2.1.10 Power supply

The power supply consists of a power transformer, filter board, and DC power supply board.

The input AC voltage is transformed into 8.6 VAC, 46 VAC, and 10 VAC by the power transformer.

These AC voltages are rectified to +8 VDC, +5 VDC, and +40 VDC levels by the DC power supply board and supplied to the control board.

(1) Filter board

The filter board consists of the power switch, AC fuse and AC noise filter.

(2) Power transformer

If the internal temperature of the power transformer rises abnormally the built-in thermal fuse will open to prevent any damage to other electrical components.

(3) Power supply board

Rectifies the AC voltage input to +8 VDC, +5 VDC and +40 VDC and supplies it to the control board.

2.2 Mechanical Operation

2.2.1 The printhead mechanism and operation (See Figure 2-3.)

The printhead is a spring charged type 24-pin driving head utilizing a permanent magnet. It is attached to the carriage and moves in parallel with the platen.

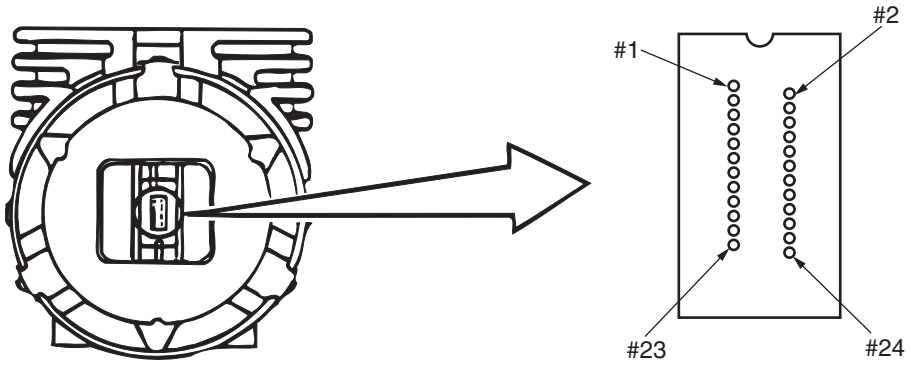


Figure 2-2 Arrangement of the head pins (View from the tip of the printhead)

(1) The printhead is composed of the following parts:

(a) Wire guide

(b) Print wires

(c) Armature assembly

(d) Yoke

(e) Spring

(f) Spacer

(g) Magnet assembly

(h) Thermistor

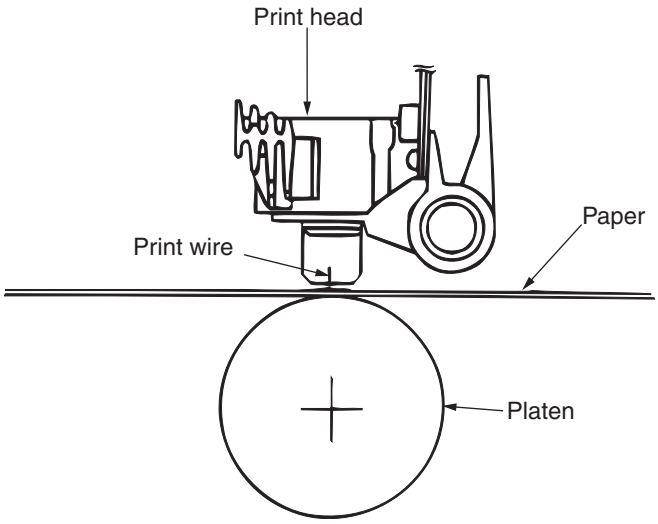
(i) Printed circuit board

(2) Operation of printhead

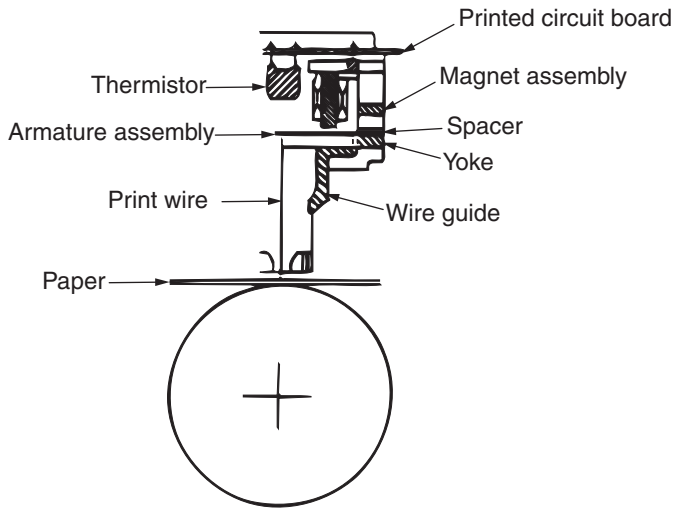
When the printhead is inactive, the armature is attracted to a permanent magnet and the spring attached to the armature is compressed. The print wires attached to each armature are thus concealed inside the wire guide.

When a signal for a character to be printed is detected, current flows through the coil. The magnetic fluxes (caused by the permanent magnet which is situated between the armature and the poles) are canceled, removing the attracting force. The armature is driven in the direction of the platen by the force of the armature spring expanding. The print wire attached to the armature protrudes from the tip of the wire guide, striking the ribbon and prints a dot on the paper.

After the character has been printed, the armature is attracted to the permanent magnet again and the print wires are concealed inside the wire guide.



(1) When printing



(2) When not printing

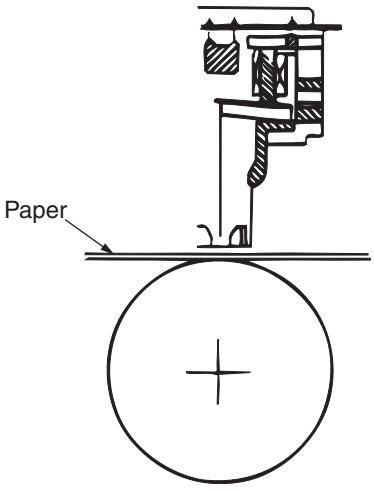


Figure 2-3

2.2.2 Spacing operation (See Figure 2-4.)

The spacing mechanism consists of a carriage shaft which is mounted in parallel with the platen, and a carriage frame which slides over the shaft. A DC motor which is mounted on the bottom surface of the carriage frame is used to move the carriage frame. The spacing mechanism consists of the following items:

(a) DC motor with gear (motor PC board included)

(b) Carriage frame

(c) Carriage shaft

(d) Space rack

(e) Encoder sensor

(f) Encoder disk

(1) Spacing operation

The carriage frame, which is connected to the printhead and space motor, slides over the carriage shaft in parallel with the platen. When the space motor rotates in clockwise direction the motor gear rotates against the space rack, moving the carriage from left to right.

For every revolution of the DC motor, the carriage frame moves 0.8 of an inch (20.32mm).

The encoder disk rotates together with the motor, interrupting the encoder sensor. The position of the carriage frame can be determined by counting the number of times the encoder sensor has been interrupted.

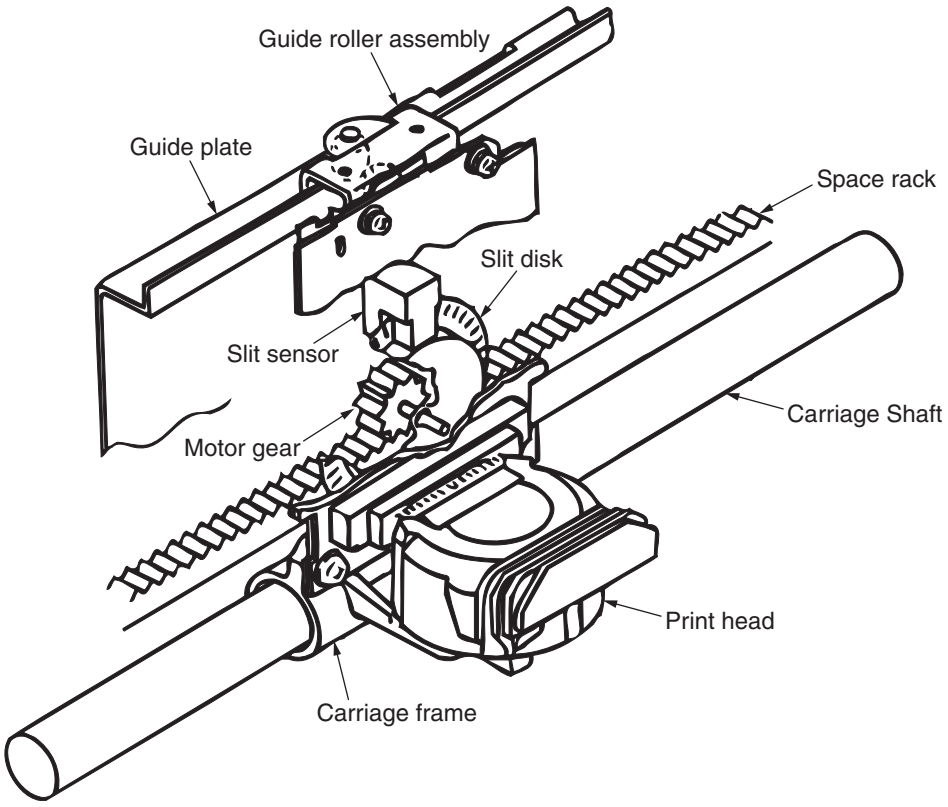


Figure 2-4

2.2.3 Head gap adjustment mechanism (See Figure 2-5.)

The head gap adjusting function adjusts the gap between the print head and the platen. Rising or lowering the lever will move the carriage shift up or down to adjust the gap.

Move the adjust lever. Its carriage shaft rotates. The adjust bushes (L) and (R) restrict the orientation of the eccentric fulcrum of the adjust lever (the part that engages with the carriage shaft). So, as the carriage shaft rotates it rises or lowers within the side frames. As the carriage shaft rises or lowers, the print head comes close to the platen or goes away from the platen.

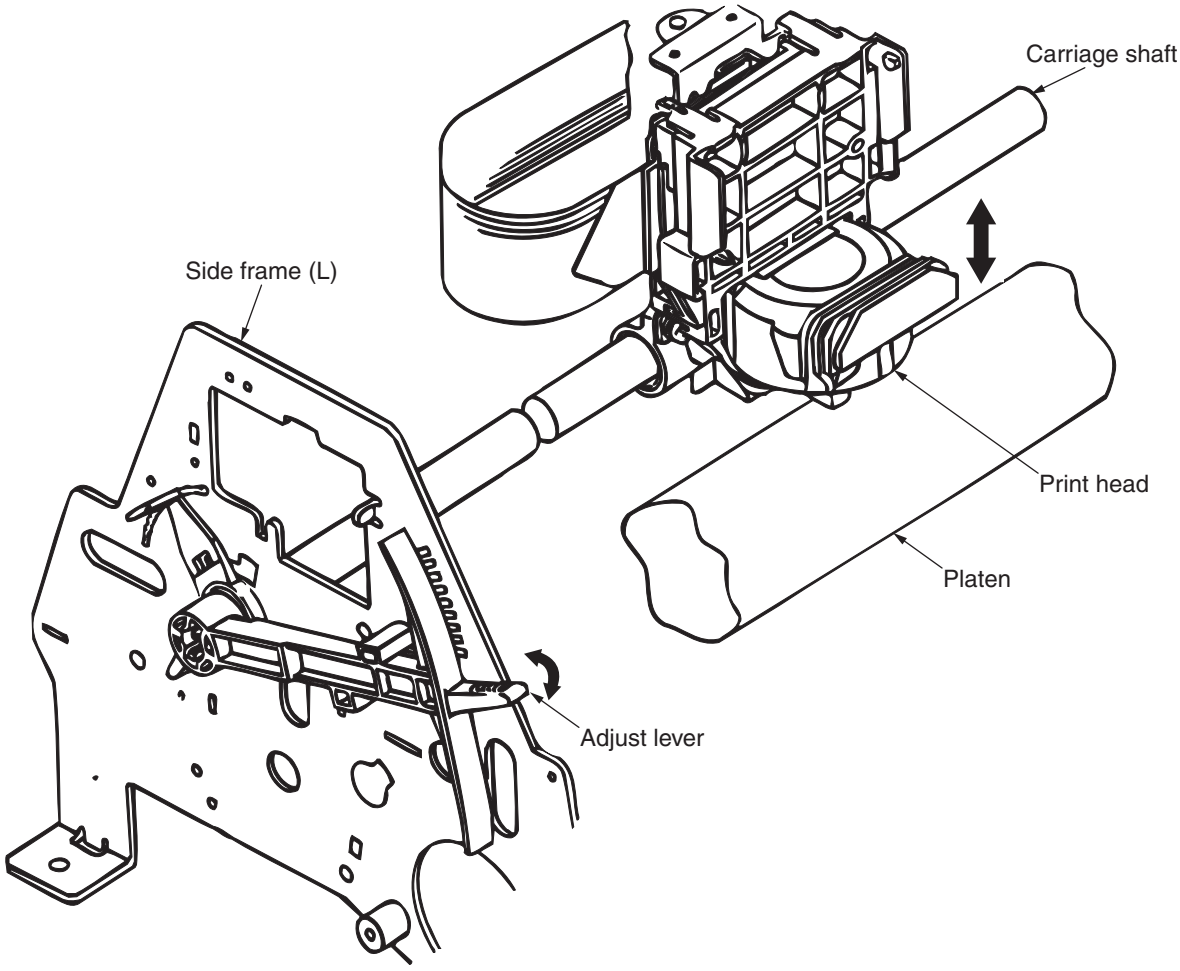


Figure 2-5

2.2.4 Ribbon drive operation (See Figure 2-6.)

The ribbon drive mechanism moves the ribbon in synchronization with the space motor operation.

The ribbon drive mechanism consists of the following items:

(a) Ribbon drive gear assembly

(b) Ribbon gear (space motor)

(c) Ribbon cartridge

(1) Ribbon cartridge

An endless ribbon with a single direction feed is used. Ink is supplied from an ink tank, which is built in to the ribbon cartridge.

(2) Ribbon feed operation

When the space motor is activated, the ribbon gear rotates. The rotation is transmitted via the ribbon drive gear assembly to the drive gear in the ribbon cartridge, thus moving the ribbon.

The feed direction of the ribbon is maintained by switching the rotational direction of the gears in the ribbon drive gear assembly. This ensures ribbon movement when bidirectional printing is used.

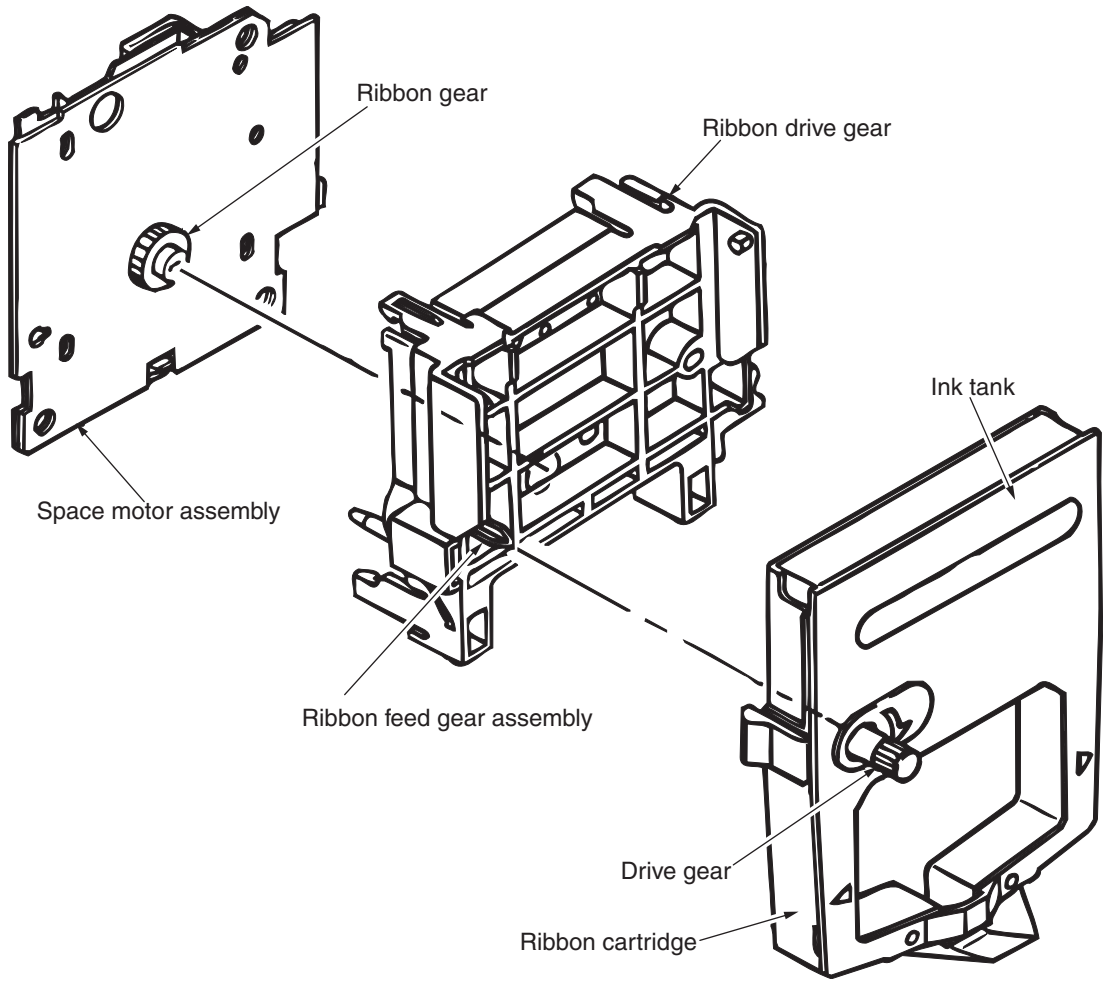


Figure 2-6

2.2.5 Paper feed operation

Paper feeding is performed by turning the platen and the pin tractor, which is driven by the LF pulse motor.

The paper feed mechanism consists of the following items:

(a) Pulse motor with gears

(b) Decelerating gear

(c) Platen

(d) Tractor feed unit

(e) Line feed roller

(1) Cut-sheet feed operation (See Figure 2-7.)

The pulse motor used for the paper feed mechanism is mounted on the left side of the printer frame, and the rotation of the motor is transmitted through decelerating gears (idler gear, platen gear) to the platen. The rotation of the platen is also transmitted to the line feed roller.

It is designed in such a way that if the stepping motor rotates 48 steps (360˚), paper is fed 1/6 inch (4.23mm).

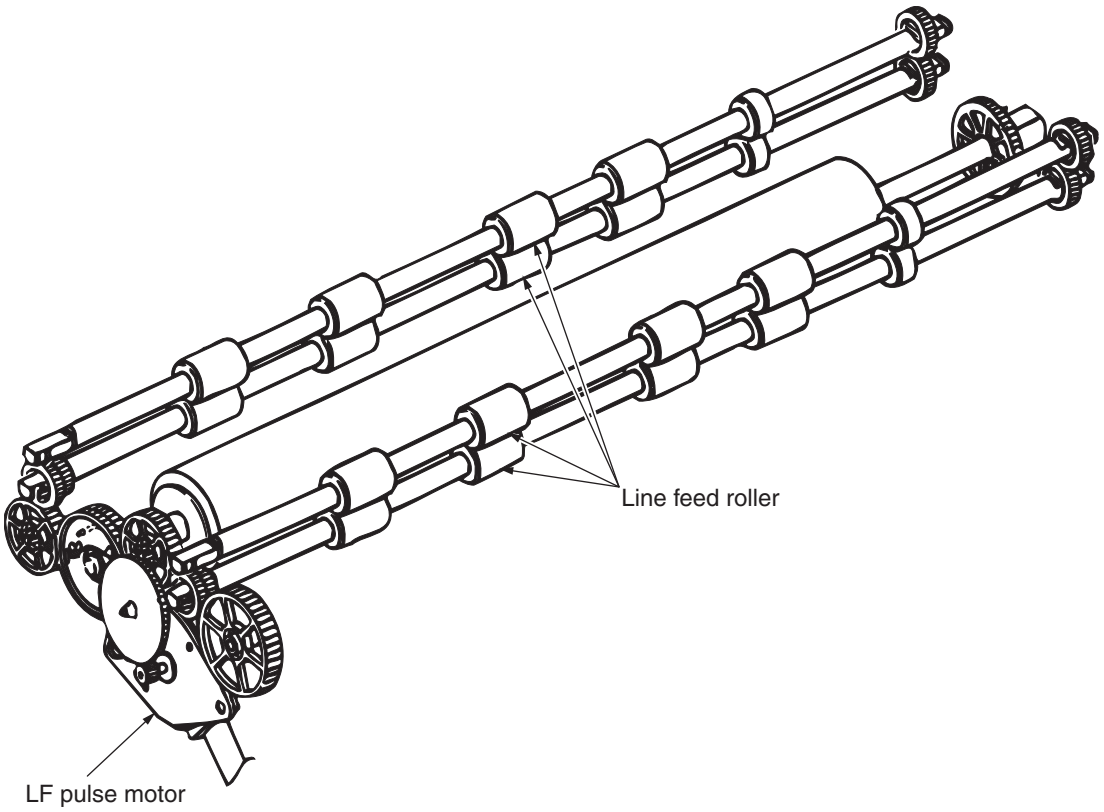


Figure 2-7

(2) Continuous paper feed operation (See Figure 2-8.)

The LF pulse motor drives the line feed roller and the pin tractor to feed the continuous paper.

- Paper feeding

The pulse motor for paper feeding is located on the left side frame. The pulse motor drives the platen gear assembly via the slowdown gear. The platen gear ass'y directly connected to the platen drives the line feed roller via the idle gear. If switched to the change gear, the line feed roller drives the pin tractor. The LF pulse motor is mechanically designed to feed the paper 1/6 inch (4.23mm) with a rotation of 48 steps (360°).

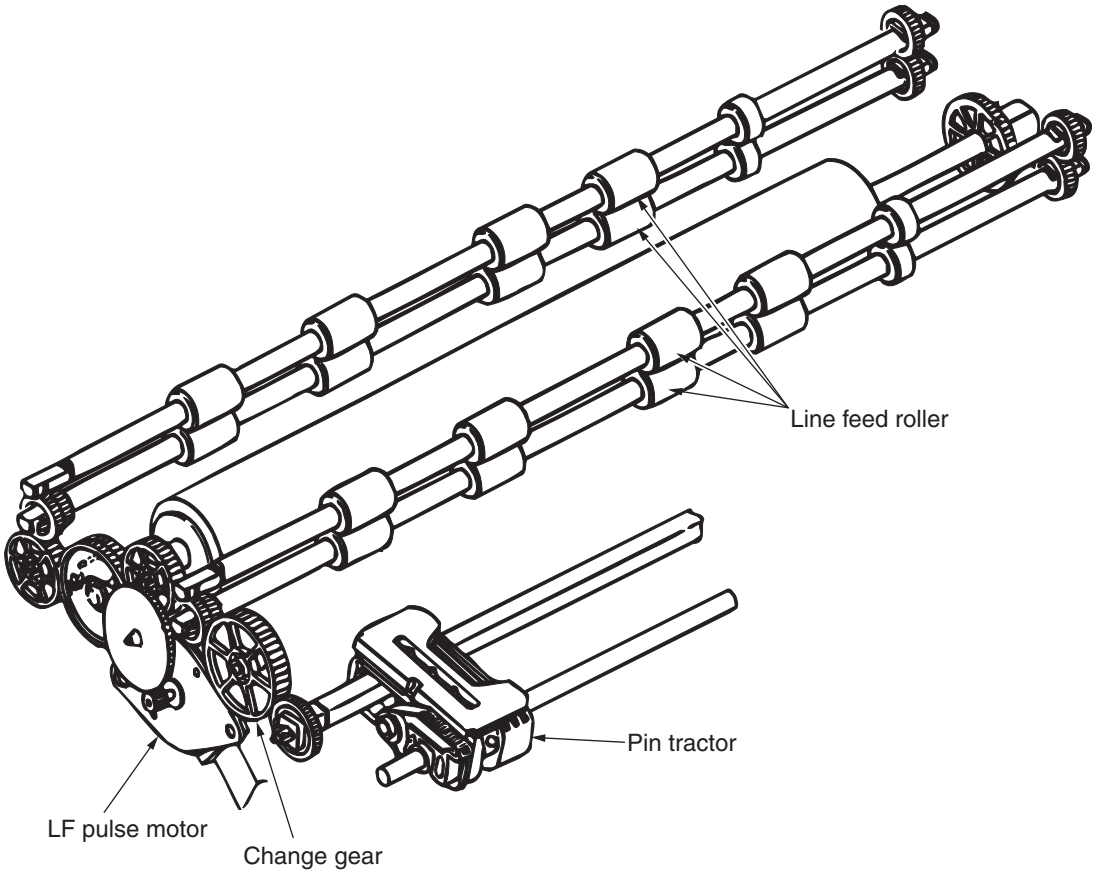
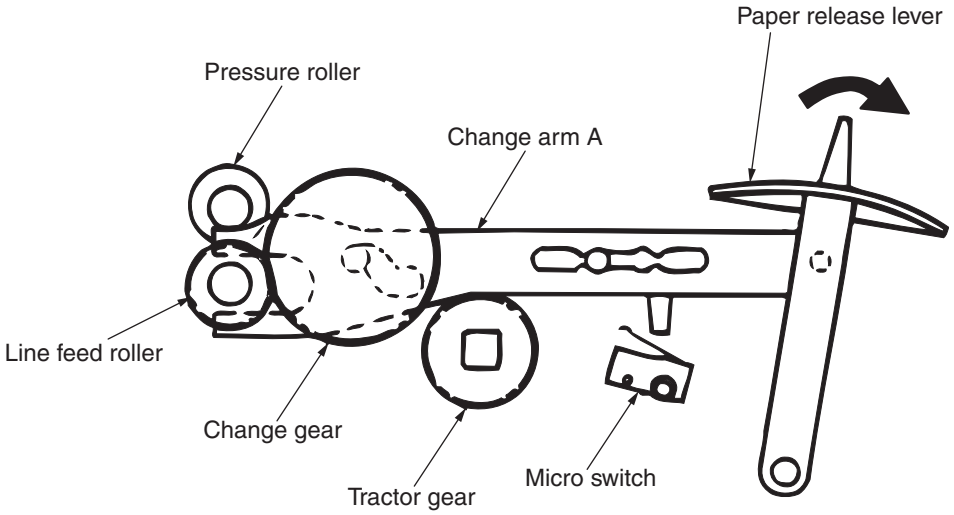


Figure 2-8

(3) Cut-sheet and continuous paper switching mechanism (See Figure 2-9.)

Set the paper release lever to the cutsheet paper position (front). The pressure roller presses on the line feed roller via change arm A. This will feed the cutsheet paper. Set the paper release lever to the continuous forms (rear) position. Change arm A raises the pressure roller to stop pressing the line feed roller. The change gear built into the change arm lowers and switches to the tractor gear side. This will feed the continuous forms.

Cut-sheet



Continuous paper

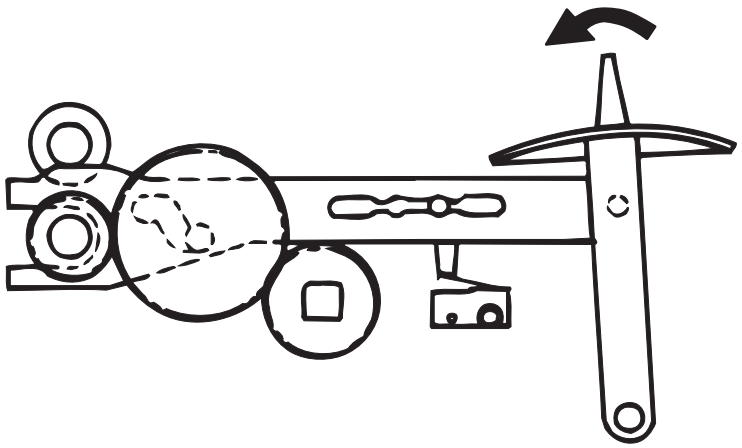
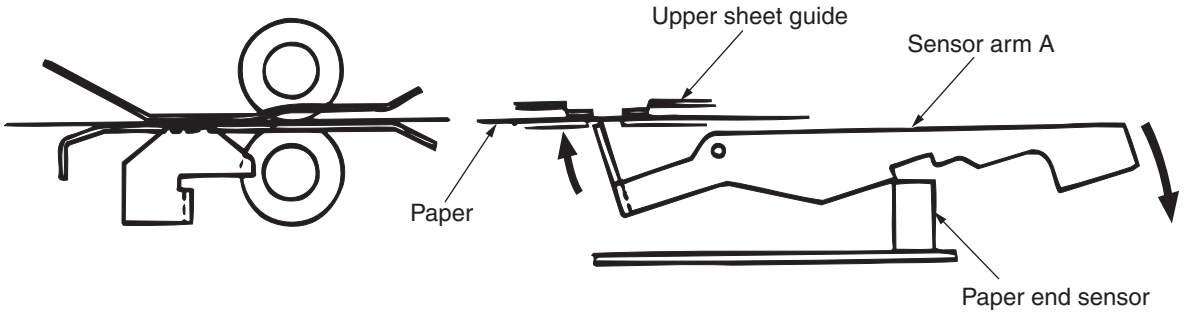


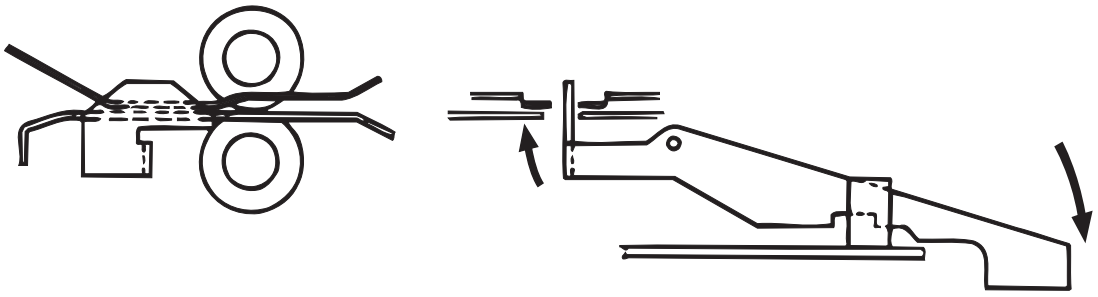
Figure 2-9

2.2.6 Paper end detection mechanism (See Figure 2-10.)

When the paper is inserted, the paper end sensor is on. This is because the paper prevents the tip of the sensor arm A from entering the upper sheet guide groove. When the paper is out, the sensor arm A enters the groove of the upper sheet guide and the end of the sensor arm A intercepts the sensor. Hence, the paper end sensor detects the end of paper. The sensor detects the paper end when the remaining paper length is about 22 mm from the print position.



Paper is inserted



No paper inserted

Figure 2-10

2.2.7 Semi-automatic sheet feeder (SASF) operation (See Figure 2-11.)

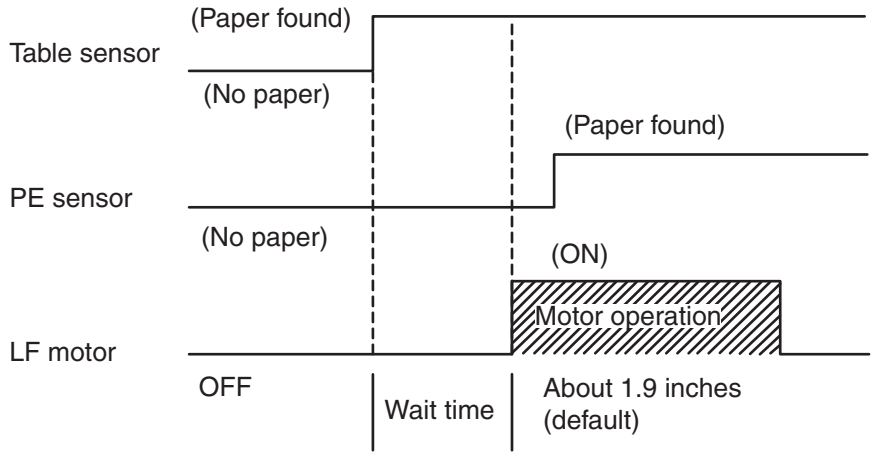
This function automatically feeds the cut-sheet or continuous forms set in the table.

(1) Theory of paper feeding

1) Put the paper on the table, then inserts the paper until table sensor detects paper.

2) Once the sensor detects, the line feed starts after the specified time (*1) (1 sec, 2 sec, or 500 ms).

3) The paper is fed into the pre-set paper feed position (*2). This ends the line feeding.

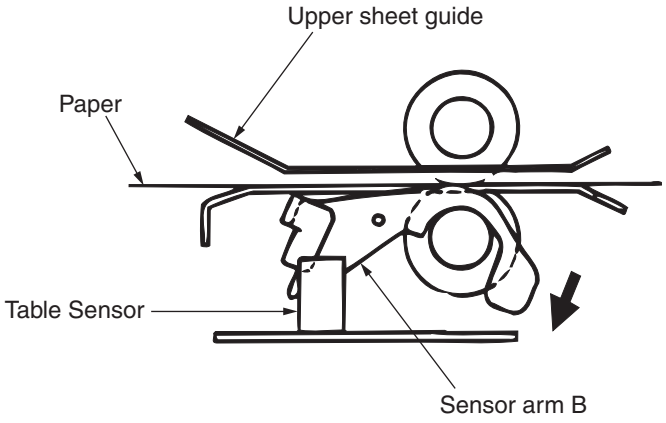


*1 Set up in the menu (wait time). (1 sec, 2 sec, or 500 ms)

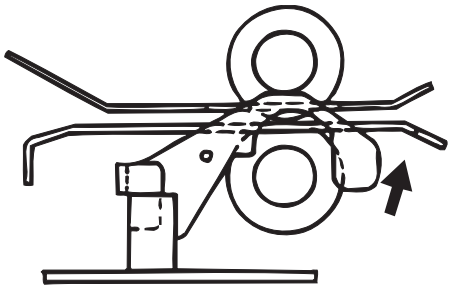
*2 The distance from the top of the paper to the center of the character is 6.35 mm by default.

Table Sensor Detection

When the paper is on the table, the stage sensor is on. This is because the paper prevents the tip of the sensor arm B from entering the upper sheet guide groove. When the paper is out, the tip of the sensor arm B enters the groove of the upper sheet guide and the end of the sensor arm B intercepts the sensor. Hence, the stage sensor detects the end of paper.



Paper is inserted

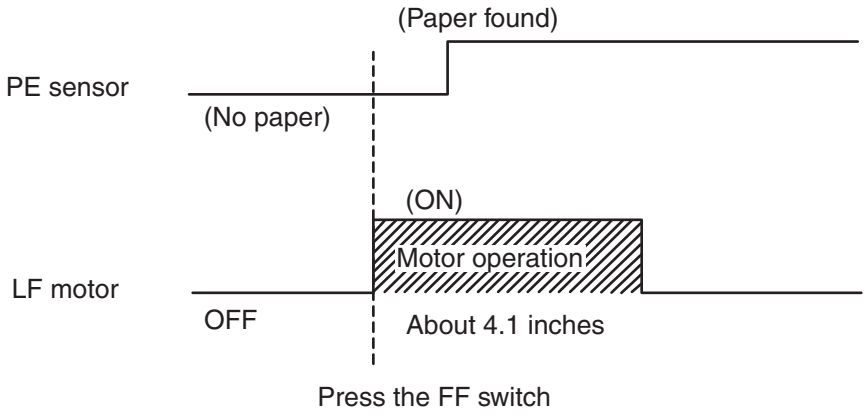


No paper inserted

Figure 2-11

(2) When using continuous sheets (auto load)

1) Set the paper switch lever to the continuous sheet side.
2) Set the paper in the push tractor.
3) Push the FF switch.
4) Start line feeding and feed up to the print position.
5) Feed about 4.1 inches.

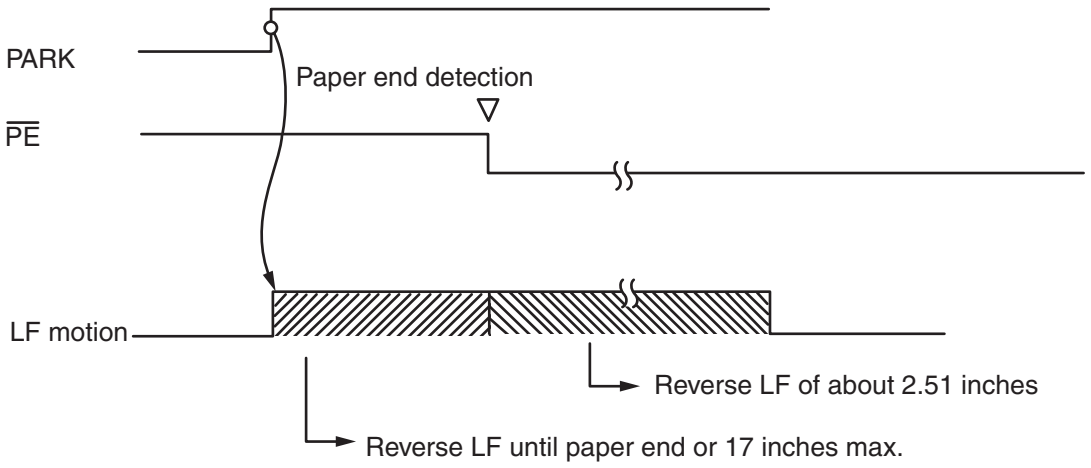


2.2.8 Reversing continuous sheets

Continuous sheets which have been inserted can be reversed automatically by using the park button on the operation panel.

Its operation is as follows:

1) Press the park button on the operation panel.
2) Reverse LF started and sheet is fed reversely until paper end occurs or 17 inches maximum.
3) Then about 2.51 inches of the sheet is fed reversely, leaving the sheet on the push tractor only.



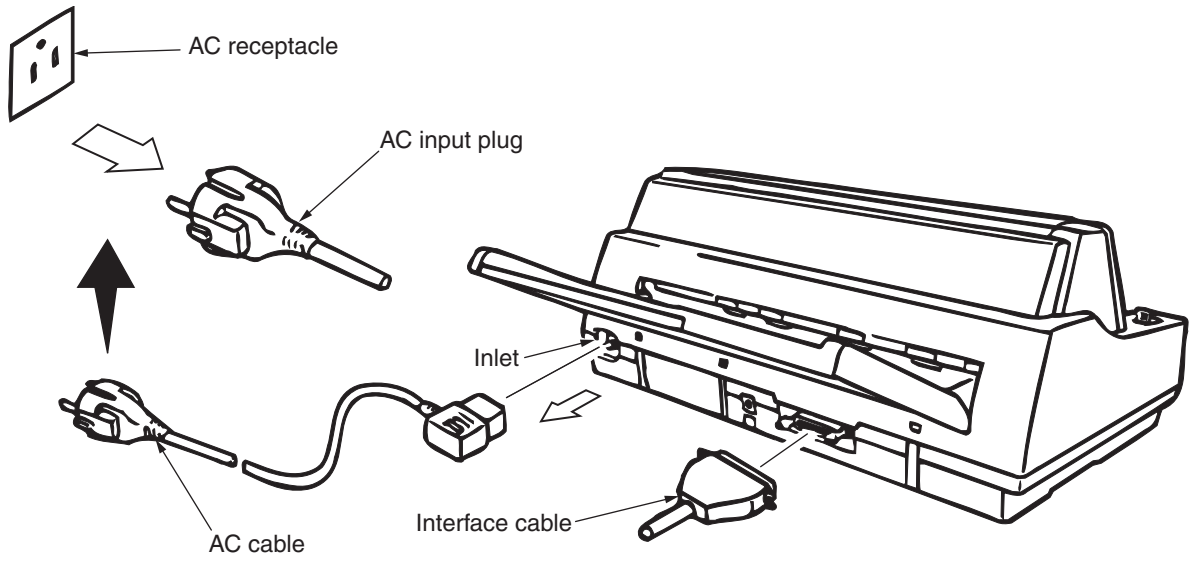
3. ASSEMBLY/DISASSEMBLY

3.1 Precautions for Parts Replacement

(1) Disconnect the AC cable and interface cable before assembling or disassembling the printer.

(a) Turn off the AC power switch. Disconnect the AC input plug of the AC cable from the AC receptacle, then disconnect the AC cable from the printer inlet.

(b) To reconnect the AC cable, first connect the AC cable to the printer inlet, then connect to the AC receptacle.



⚠Warning	Risk of Electric Shock	⚠

There is a risk of electric shock during replacement of the low voltage power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cord is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

(2) Do not disassemble the printer as long as it is in good operating condition.

(3) Do not remove parts unnecessarily. Disassembly should be the minimum necessary .

(4) Use only the specified maintenance tools.

(5) Disassemble the printer in the specified order of disassembly procedures.

(6) ICs such as the microprocessor, ROM, and RAM can easily be damaged by static electricity. Do not wear any items of clothing that are apt to produce static electricity when handling printed-circuit boards.

(7) Do not place the printed-circuit boards directly on the printer or the floor.

3.2 Maintenance Tools

Table 3-1 lists tools required for replacing parts of the printed boards and units in the field. More tools may be required in other maintenance procedures.

Table 3-1 Maintenance Tools

No.	Maintenance tool	Quantity	Purpose of tool	Remarks
1	No. 1-100 Phillips-tip screwdriver	1	2 to 2.6 mm screw	
2	No. 2-100 Phillips-tip screwdriver	1	3 to 5 mm screw	
3	No. 3-100 screwdriver	1		
4	No. 5 nipper	1		
5	Round pliers No. 3	1		
6	Thickness gage	1	Head gap adjusting	
7	Flat-blade screwdriver	1	(Removing the upper cover)	

3.3 Disassembling and Assembling Parts

This section explains the disassembling and assembling procedures of the parts shown in the exploded views listed below. Only the disassembly procedures are explained. Just reverse the steps for assembling.

- 3.3.1 Upper cover assembly
  - 3.3.2 Space rack
  - 3.3.3 Printer unit
    - 3.3.4 Control board
    - 3.3.5 Sensor board
    - 3.3.6 Power supply board (power supply unit)
    - 3.3.7 Transformer (power supply unit)
    - 3.3.8 Filter board (power supply unit)
    - 3.3.9 LF pulse motor
      - 3.3.10 Platen assembly
    - 3.3.11 Micro switch assembly
      - 3.3.12 Feed roller shaft
  - 3.3.13 Operation board
  - 3.3.14 Tractor assembly (Right, Left)
  - 3.3.15 Table assembly
  - 3.3.16 Feed roller spring
  - 3.3.17 Stacker shaft
- 3.3.18 Print head
  - 3.3.19 Ribbon feed gear assembly
    - 3.3.20 Space motor assembly
    - 3.3.21 Head cable
    - 3.3.22 Guide roller

3.3.1 Upper cover assembly

[Note] *Remove the cutsheet feeder (option), if mounted.*

(1) Remove the platen knob ① and remove the sheet stacker ②.

(2) Raise the adjust lever ③ to its upper most position to open table assembly ④.

(3) Remove the tapping screw ⑤, then remove the cover stopper ⑦ in two locations. (Be careful not to loose the washer ⑥ that comes off together with the tapping screw and cover stopper.)

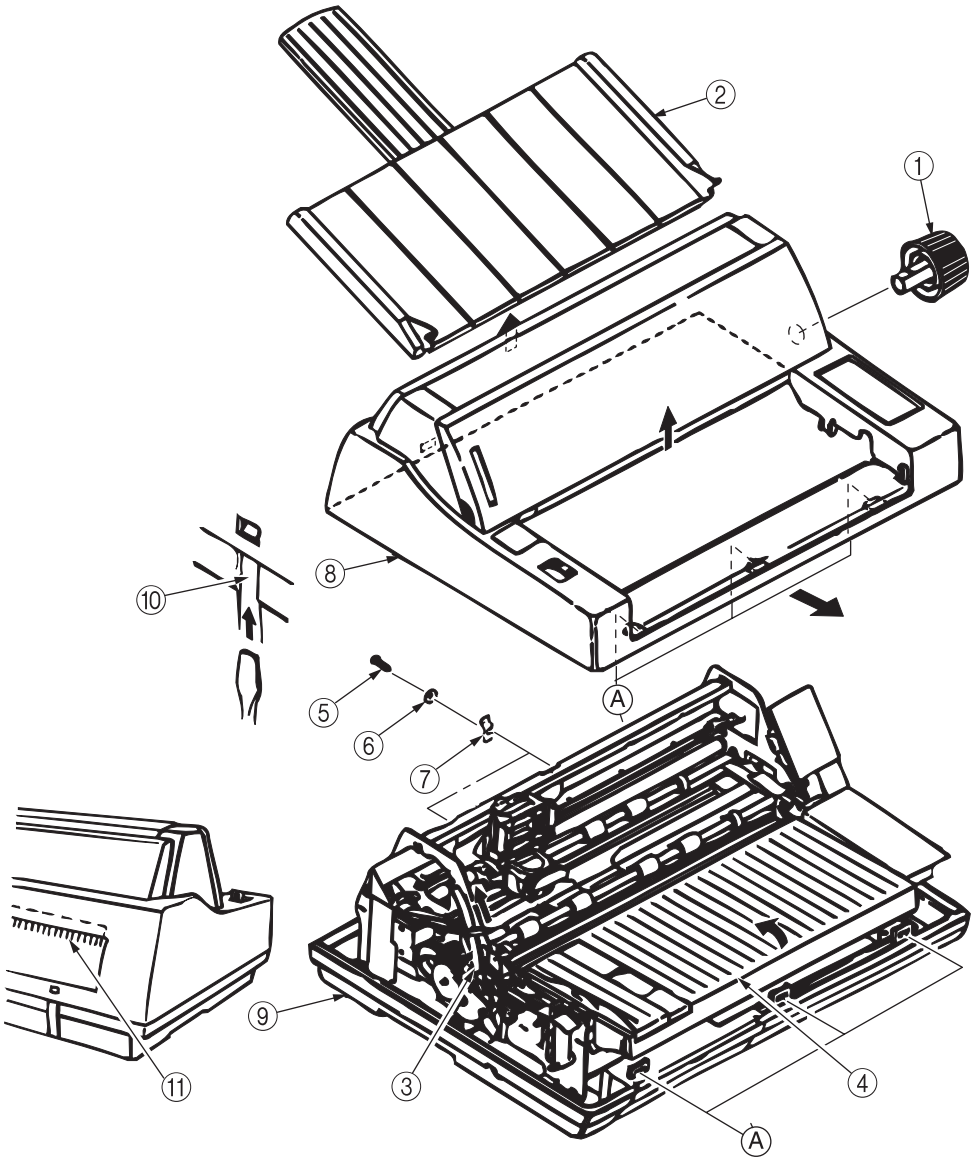
(4) Disengage the upper cover assembly ⑧ from the lower cover assembly ⑨ in three rear locations. To disengage, insert the flat-blade screwdriver into the three grooves ⑩ of the lower cover assembly.

(5) Disengage the upper cover assembly ⑧ from the lower cover assembly ⑨ in three front locations. To disengage, raise the rear part a little and slide forward using the front part of the upper cover assembly as the fulcrum.

(6) Lift the upper cover assembly ⑧ up and off the unit.

[Notes on reassembly]

- *When reinstalling the upper cover assembly ⑧, be careful to make sure that the discharging brush ⑪ in the rear of the upper cover assembly does not get caught by the upper cover assembly.*



3.3.2 Space rack

(1) Remove the upper cover assembly. (See section 3.3.1)

(2) Remove the spring ① and unlock the claw ④ of the space rack ③ from the hole of the carriage guide plate ②.

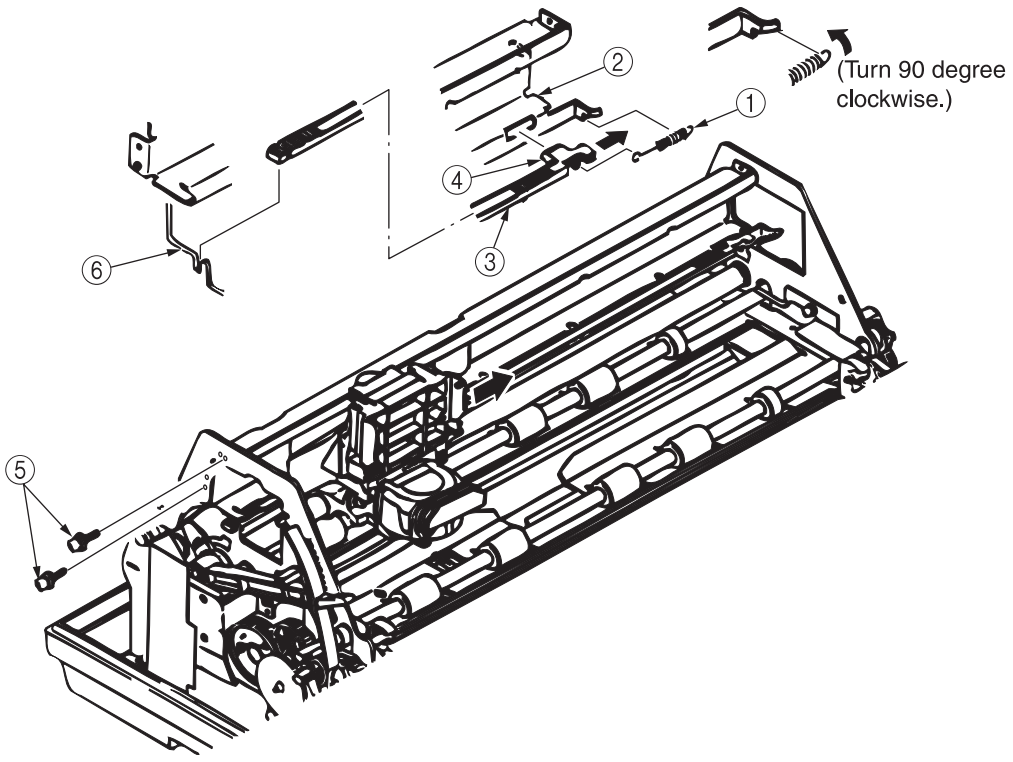
(3) Slide the carriage unit to the right.

(4) Remove the two screws ⑤ to remove the projective part of the carriage guide plate ②, from the hole of the side frame ⑥.

(5) Remove the space rack ③ from the notch of the side frame ⑥ and slowly draw it out from the right side.

[Notes on installation]

- When mounting the carriage guide plate ②, make sure that it touches the top surface of the space rack ③.
- Before mounting the spring ①, twist the right side of the spring 90˚ clockwise.
- Make sure to firmly lock the claw 4 of the space rack ③ into the hole of the carriage guide plate ②.
- Firmly insert the projective part of the carriage guide plate ② into the hole of the side frame ⑥ and fix it with screws.
- *After mounting, check the gap between the print head and the platen and adjust the gap if necessary. (See 4.1.)*



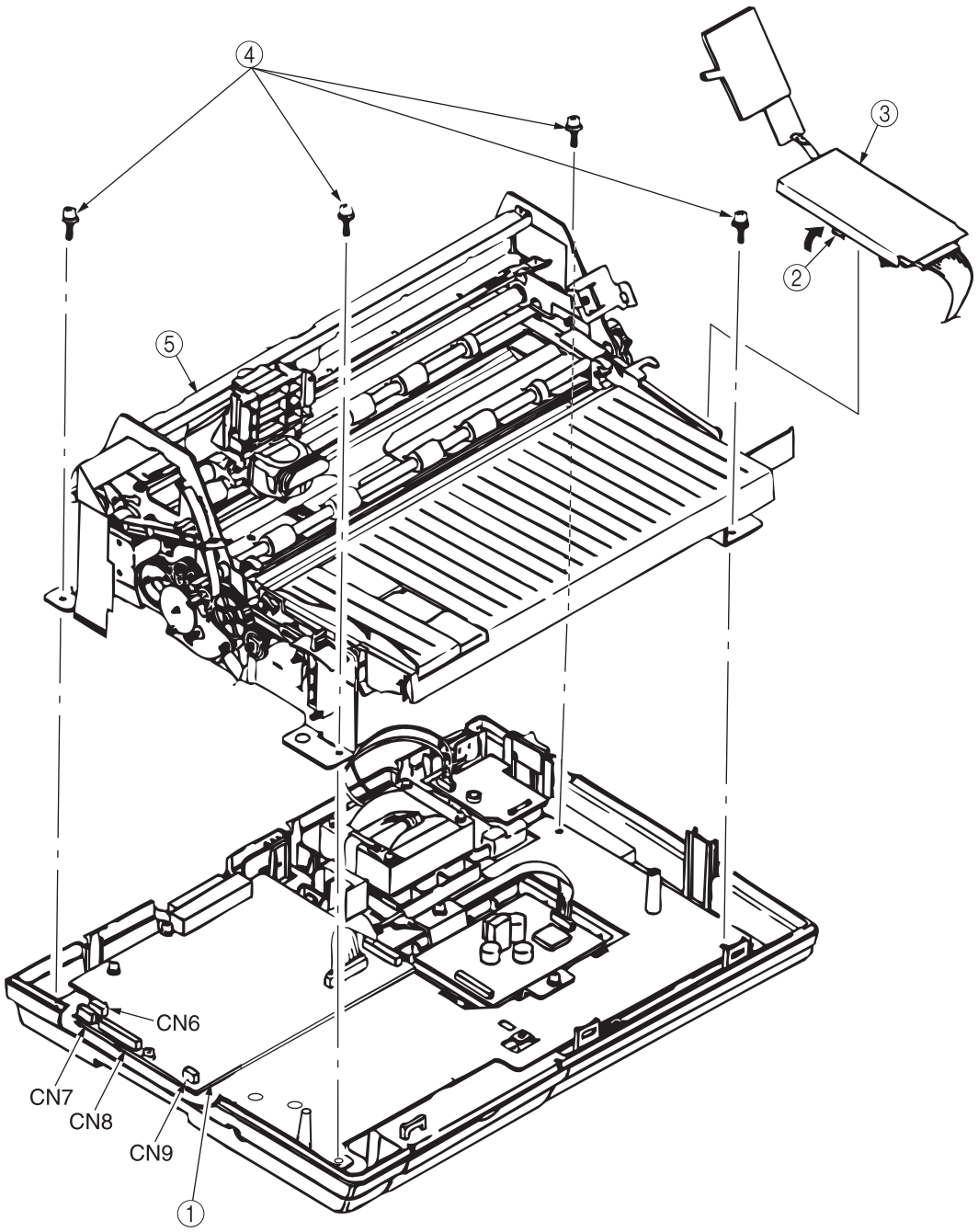
3.3.3 Printer unit

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the cable from the connectors (CN6, CN7, CN8, and CN9) of the Control board ①.

(3) Slide the operator panel assembly ③ closer towards you and draw it out while pressing the claw ②.

(4) Remove four screws ④ to remove the printer unit ⑤.



3.3.4 Control board

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

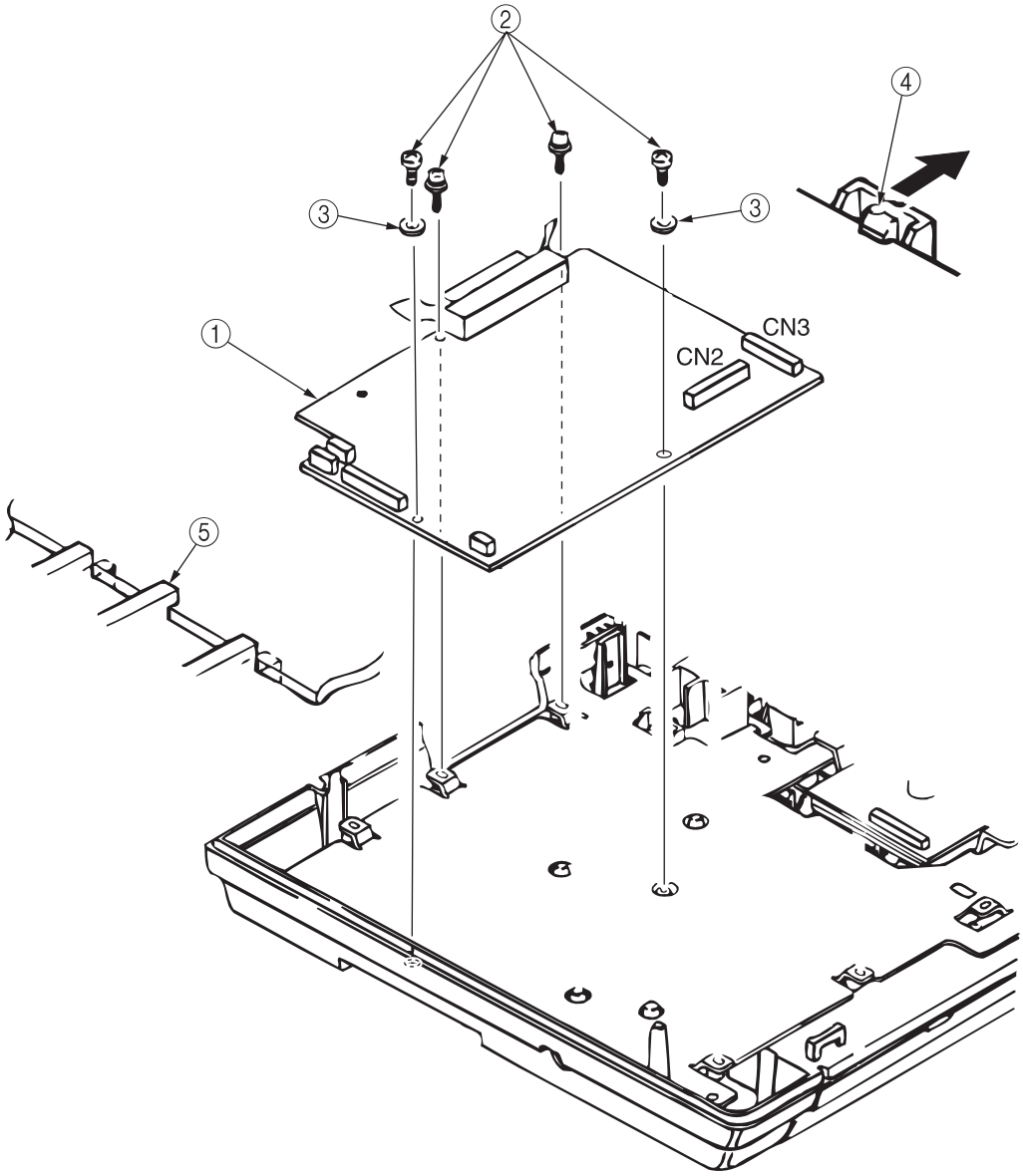
(3) Remove the cable from the connectors (CN2 and CN3) on the Control board ①.

(4) Remove four scerws ②.
(Be careful not to loose the washer ③ that synchronously comes off.)

(5) Unlock two claws ④ and remove the Control board ①.

[Notes on installation]

- Make sure that the Control board ① is firmly locked with the two claws ④ and guide ⑤.



3.3.5 Sensor board

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

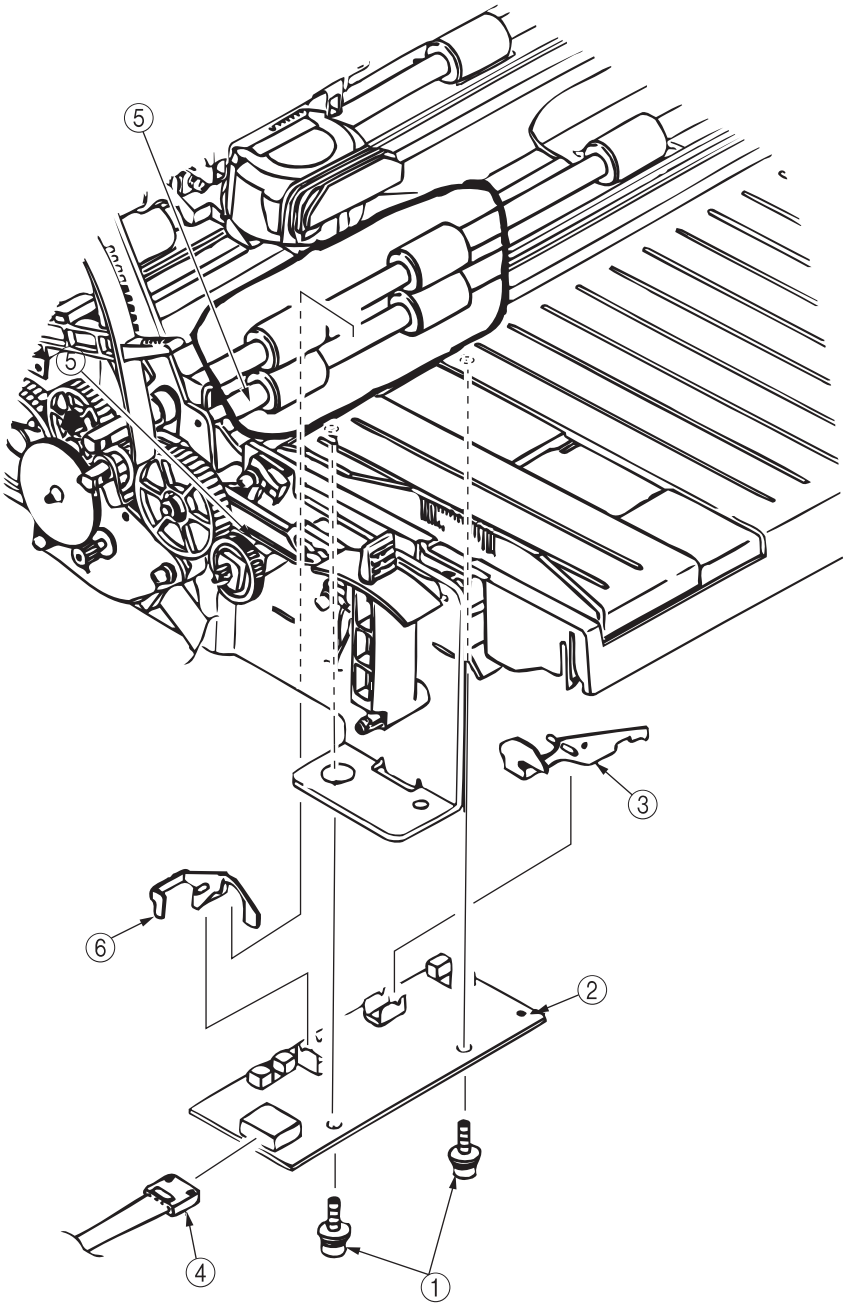
(3) Remove two screws ① to remove the Sensor board ② and sensor arm A ③.

(4) Remove the sensor arm B ⑥ while paying attention to the feed roller shaft ⑤.

(5) Remove the cable ④ from the Sensor board ②.

[Notes on installation]

- Before mounting the Sensor board ②, check that the sensor arm A ③ and sensor arm B ⑥ move smoothly.



3.3.6 Power Supply board (power supply unit)

⚠Warning	Risk of Electric Shock	⚠

There is a risk of electric shock during replacement of the low voltage power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cord is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

(1) Remove the upper cover assembly. (See 3.3.1.)

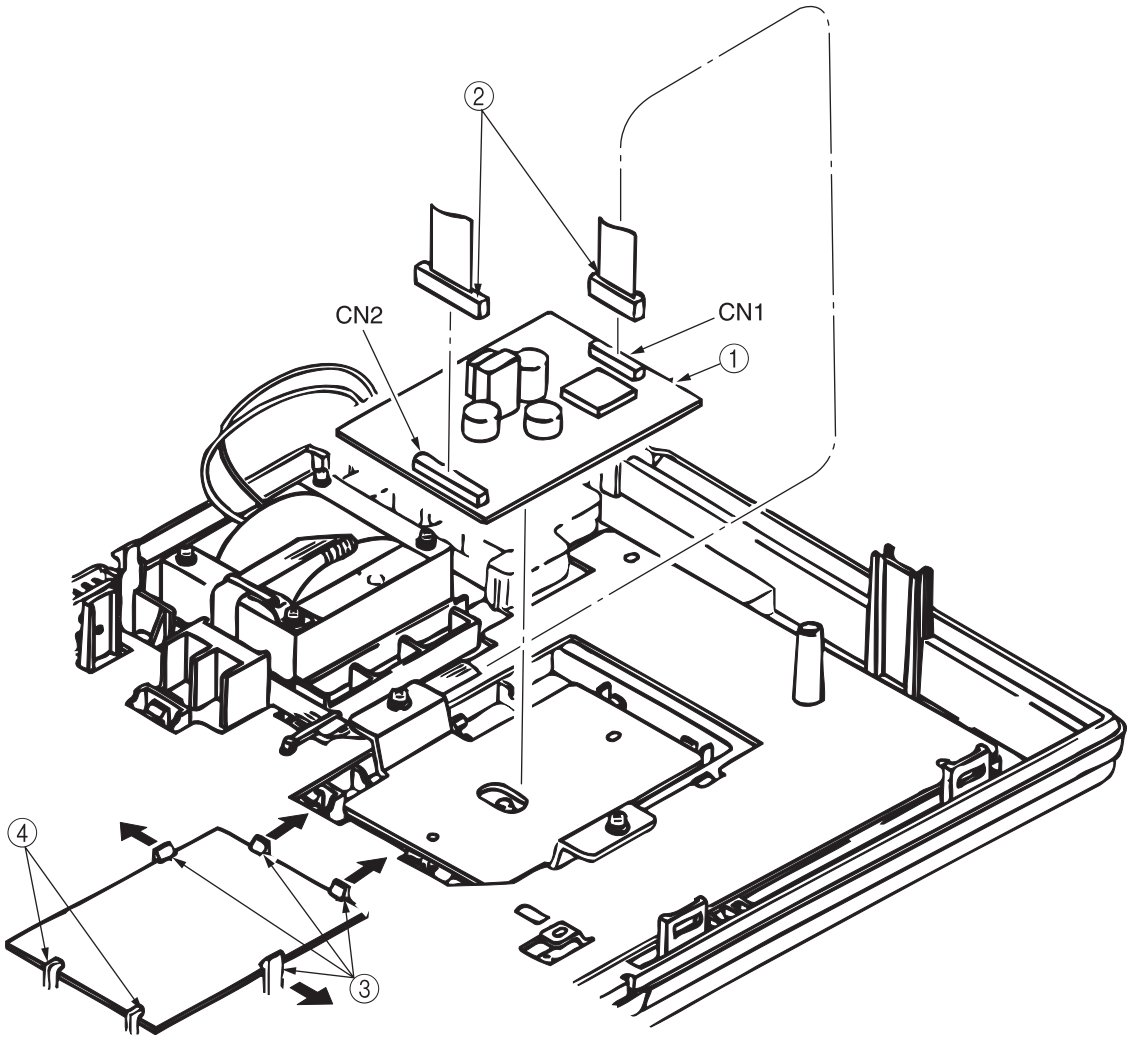
(2) Remove the printer unit. (See 3.3.3.)

(3) Remove the cable (CN1 and CN2) ② from the power supply board ①.

(4) Unlock four claws ③ to remove the power supply board ①.

[Notes on installation]

- Make sure that the power supply board ① is firmly locked with four claws ③ and two guides ④.



3.3.7 Transformer (power supply unit)

(1) Remove the upper cover assembly. (See 3.3.1)

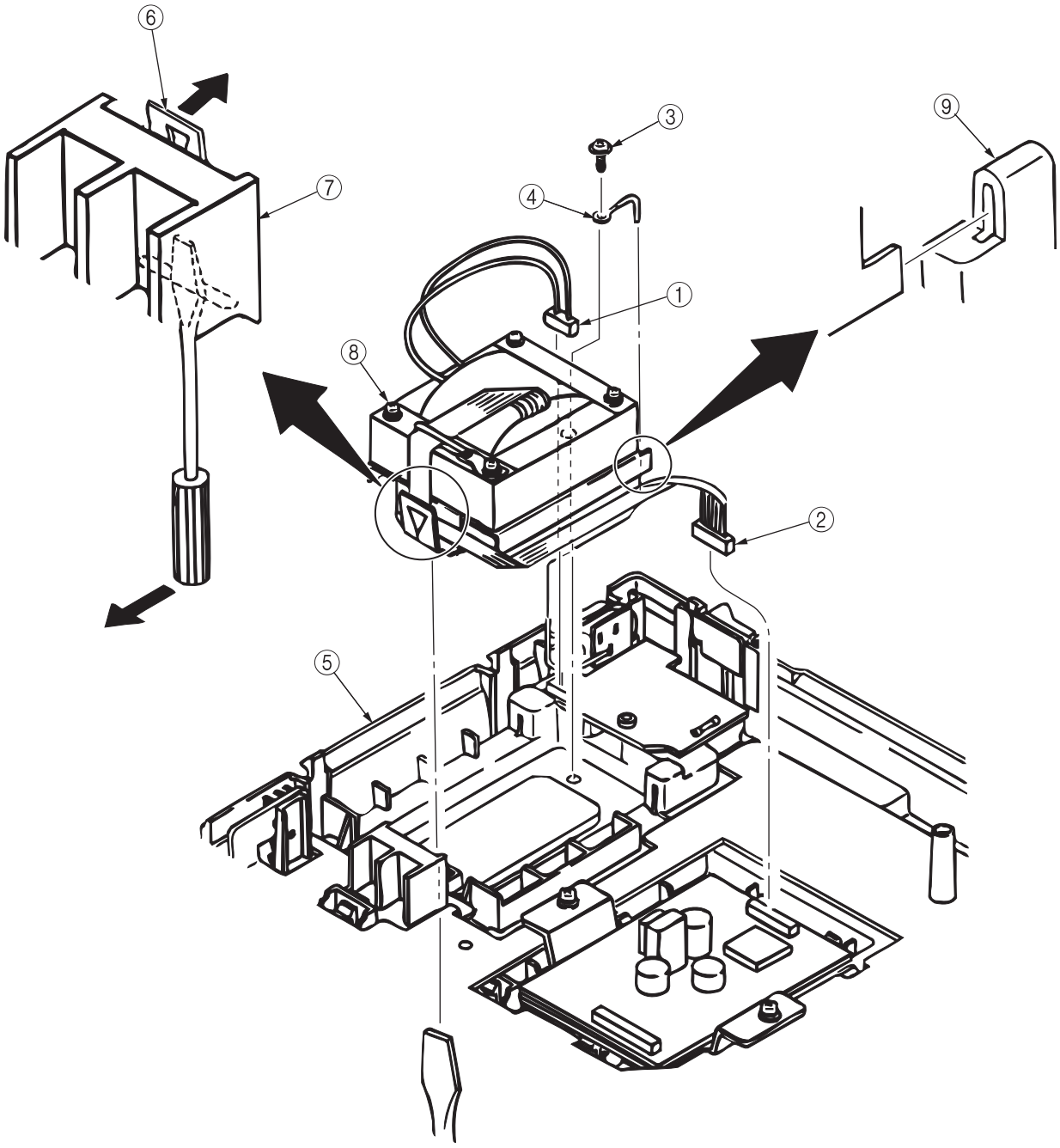
(2) Remove the printer unit. (See 3.3.3)

(3) *Remove the cable ① from the filter assembly and remove the cable ② from the power supply board.*

(4) Remove the screw ③ to remove the ground wire ④.

(5) Insert the flat-blade screwdriver from the rear lower cover assembly ⑤ and push the lock spring ⑥ to the right to remove the transformer ⑧ from the transformer clamp A ⑦.

(6) Raise the left side of the transformer ⑧, slide out the transformer ⑧ from the transformer clamp B ⑨.



3.3.8 Filter board (power supply unit)

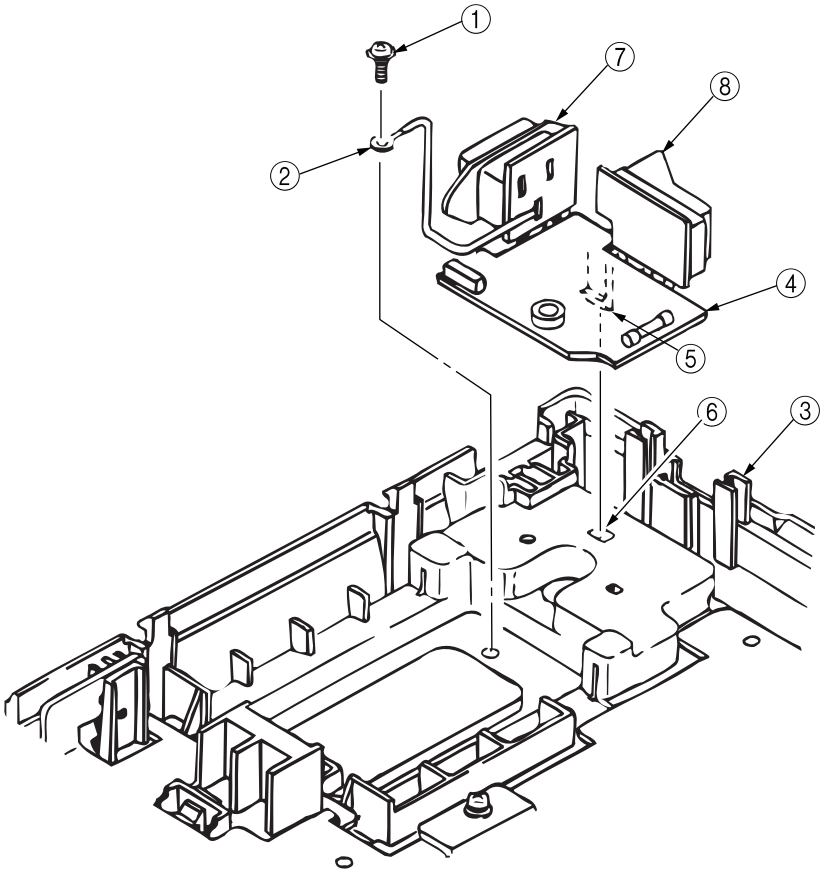
(1) Remove the upper cover assembly. (See 3.3.1)

(2) Remove the printer unit. (See 3.3.3)

(3) Remove the screw ① to remove the ground wire ②.

(4) Reach the claw ⑤ of the filter assembly ④ from the rear lower cover assembly ③. Release the claw ⑤ from the locking position ⑥.

(5) Remove the AC inlet ⑦ and AC power switch ⑧ from the guide to remove the filter assembly ④.



3.3.9 LF pulse motor

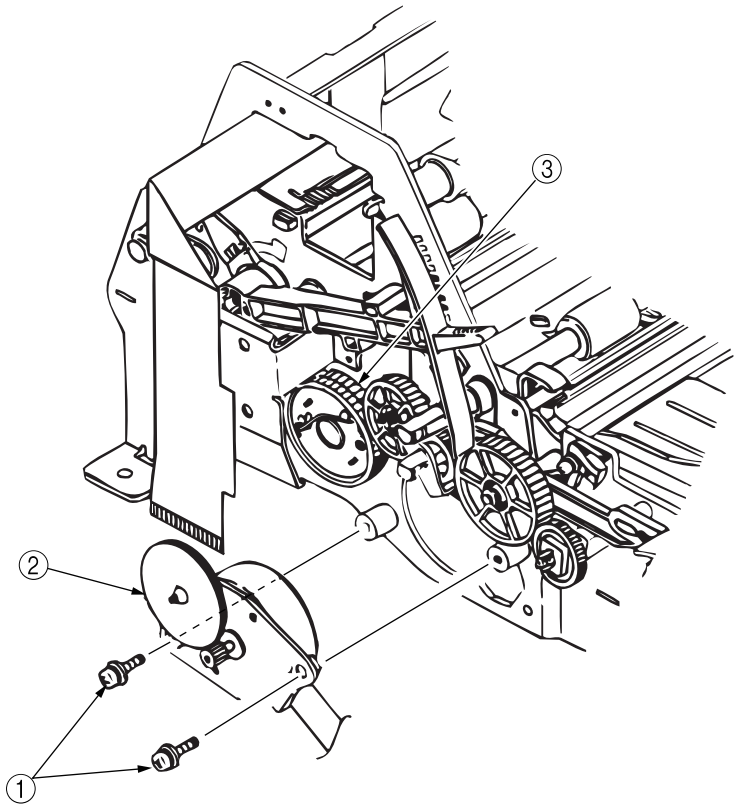
(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3)

(3) Remove two screws ① to remove the LF pulse motor ②.

[Notes on installation]

- Lightly push the LF pulse motor ② towards the platen gear assembly ③ and fix with the screw ①.



3.3.10 Platen assembly

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

(3) Remove the Sensor board. (See 3.3.5.)

(4) Remove the LF pulse motor. (See 3.3.9.)

(5) Remove screw ① to remove the cable guide ②.

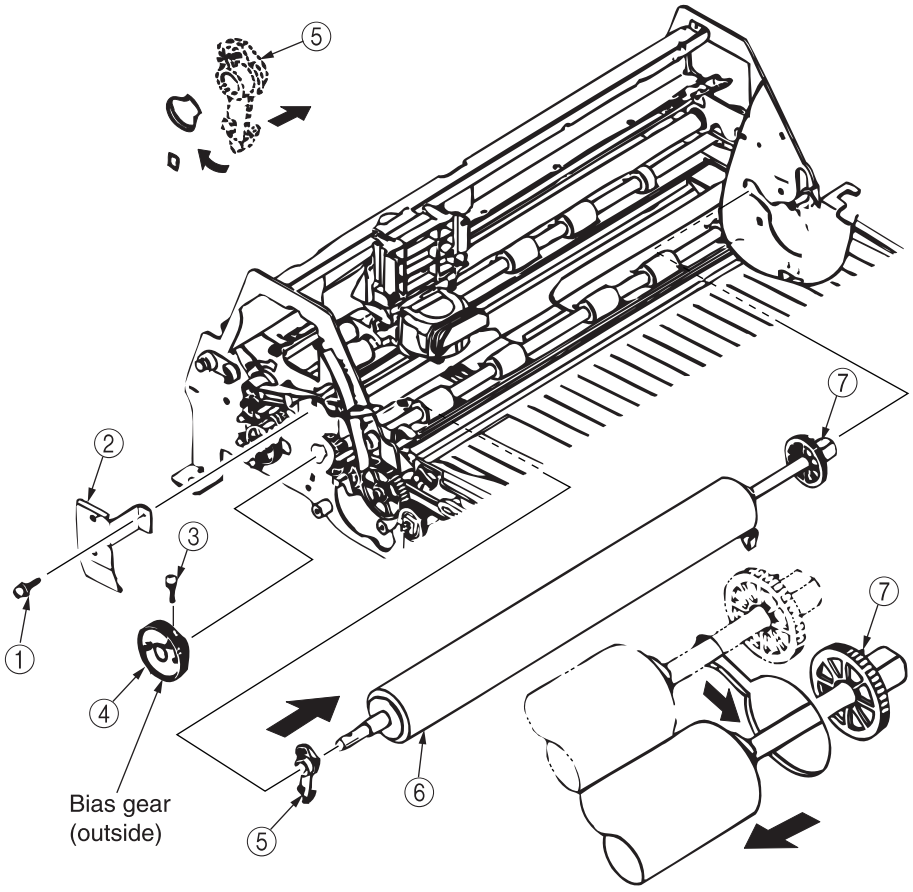
(6) Remove screw ③ to remove the platen gear assembly ④.

(7) Pull the knob of the platen collar ⑤ so that the projective part matches the notch of the left side frame. Unlock towards inside.

(8) Slide the platen assembly ⑥ to the right and remove it from the left side frame. Move the platen assembly ⑥ towards you until the hole of the right side frame matches the platen gear ⑦. Move the platen assembly ⑥ further to the left to be removed from the right side frame.

[Notes on installation]

- Be careful of the mounting orientation of the platen collar ⑤.
- When the platen assembly ⑥ is mounted, shift the bias gear of the platen gear assembly ④ half step clockwise to be engaged with the left and right gears.
- After mounting the platen assembly ⑥, adjust the LF pulse motor backlash (See 3.3.9) and adjust the gap between the print head and the platen (See 4.1).



3.3.11 Micro switch assembly

The micro switch assembly consists of three micro switches.

Replace the entire micro switch assembly.

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

(3) Cut the tie-lap ① that fixes the swich cable ② to the lefts side frame ③.

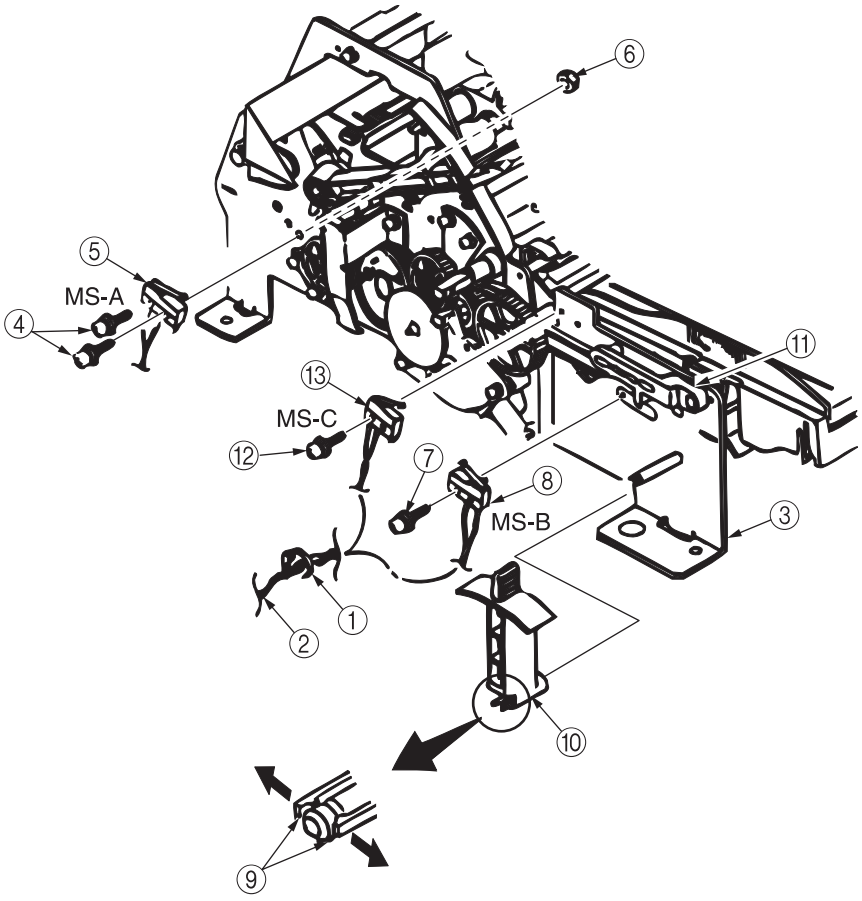
(4) Remove the micro switch A.
Remove two screws ④ to remove the micro switch A ⑤.
(Be careful not to loose the nut ⑥ that synchronously comes off.)

(5) Remove the micro switch B.
Remove screw ⑦ to remove the micro switch B ⑧.

(6) Remove the micro switch C.
i) Unlock the claw ⑨ to remove the paper release lever ⑩.
ii) Remove the change lever A ⑪ from the post and pull downward.
iii) Remove screw ⑫ to remove the micro switch C ⑬.

[Notes on installation]

- *After mounting the micro switch A, adjust the position (See 4.2).*
- *When mounting micro switches A, B, and C, be careful not to reverse them.*



3.3.12 Feed roller shaft

There are four feed roller shafts, two each on the front and the rear. Replacement procedures are shown below.

• Front

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

(3) Remove screw ① to remove the feed roller spring A ②.

(4) Remove screw ③ to remove the feed roller spring B ④.

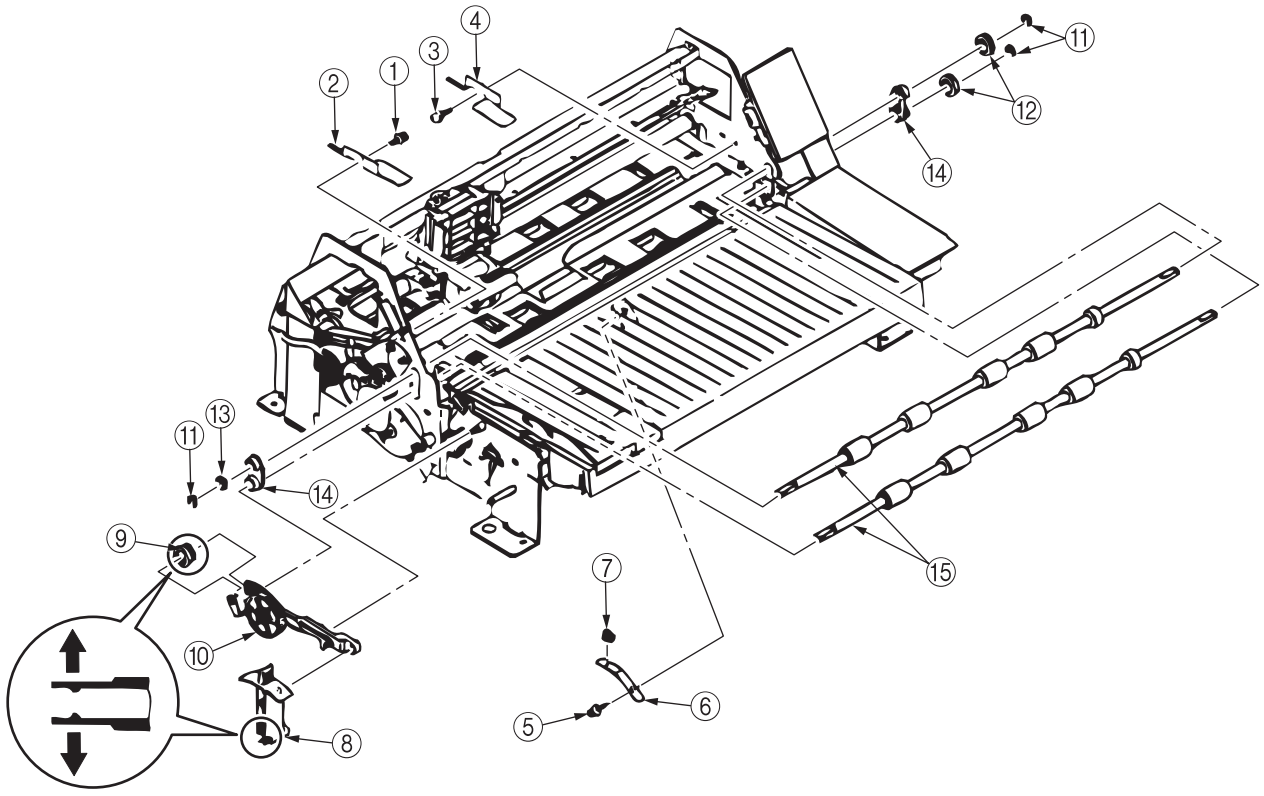
(5) Remove screw ⑤ to remove the feed roller spring C ⑥. (Be careful not to loose the pressure roller piece ⑦ that comes off at the same time.)

(6) Unlock the claw, then remove the change lever ⑧.

(7) Unlock the claw of the LF gear ⑨, then remove the change gear bracket assembly ⑩.

(8) Remove three E-clips ⑪ , two LF knob gears ⑫ (right), flange ⑬ (left), and two LF bushes ⑭ (left and right).

(9) Remove the two feed roller shafts ⑮.



• Rear

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the printer unit. (See 3.3.3.)

(3) Remove screw ① to remove the feed roller spring A ②.

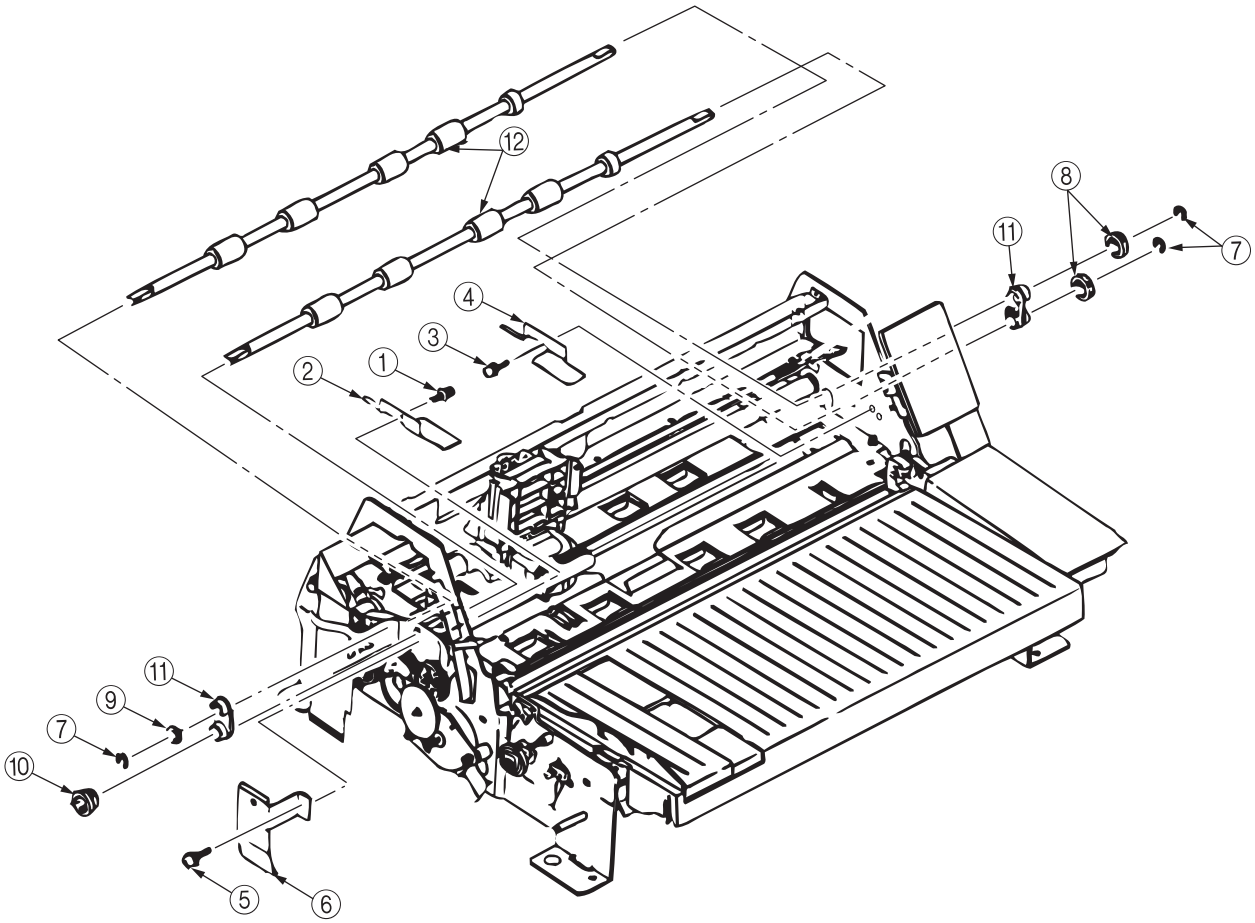
(4) Remove screw ③ to remove the feed roller spring B ④.

(5) Remove screw ⑤ to remove the cable guide ⑥.

(6) Remove three E-clips ⑦, two LF knob gears ⑧ (right), and flange ⑨ (left).

(7) Remove the LF gear ⑩ (left) and two LF bushes ⑪.

(8) Remove the two feed roller shafts ⑫.



3.3.13 Operation board

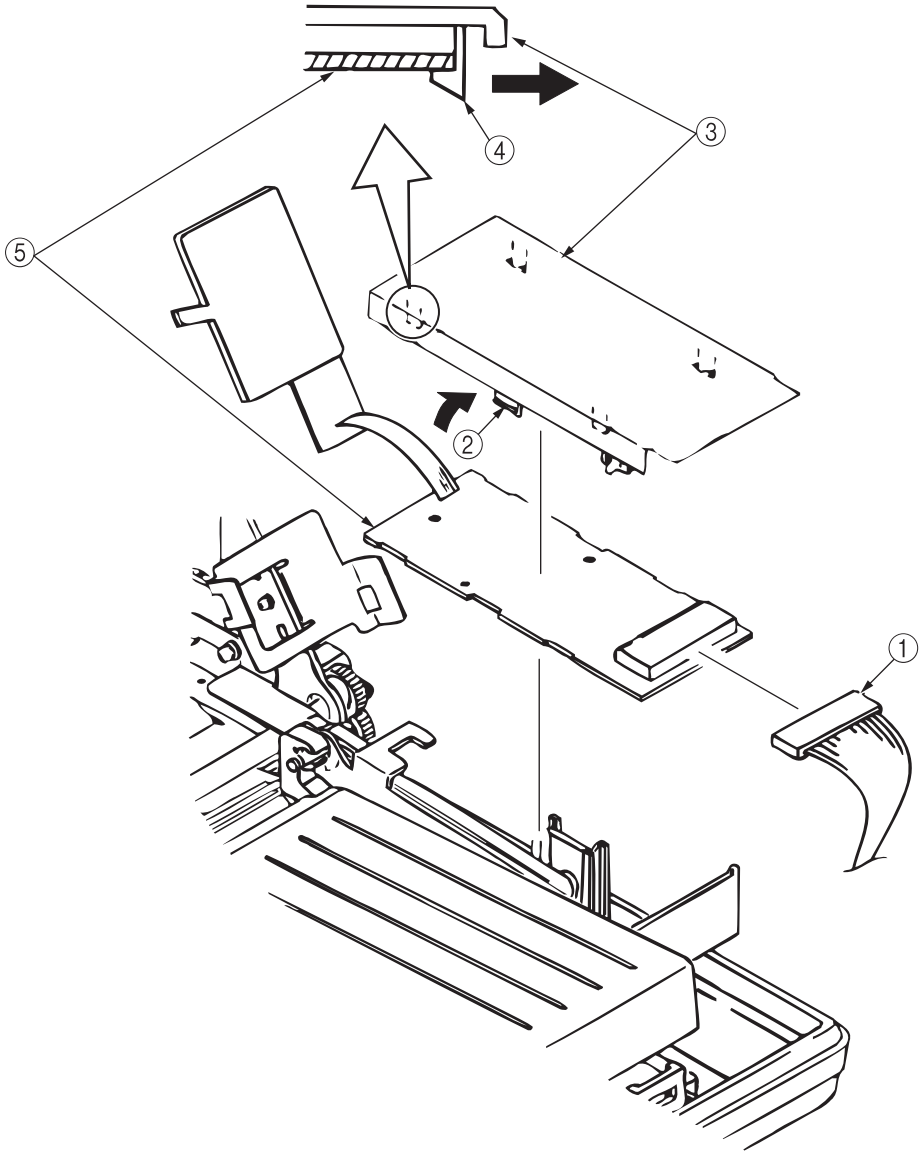
(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the cable ① and lift up the operator panel assembly ③ while pressing the claw ②.

(3) Unlock four claws ④ to remove the Operation board ⑤.

[Notes on installation]

- Firmly lock the Operation board ⑤ with four claws ④.



3.3.14 Tractor assembly (Right, Left)

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Lower the paper release lever ① to open the table assembly ②.

(3) Remove the sheet guide ③ to remove the E-clip ④.

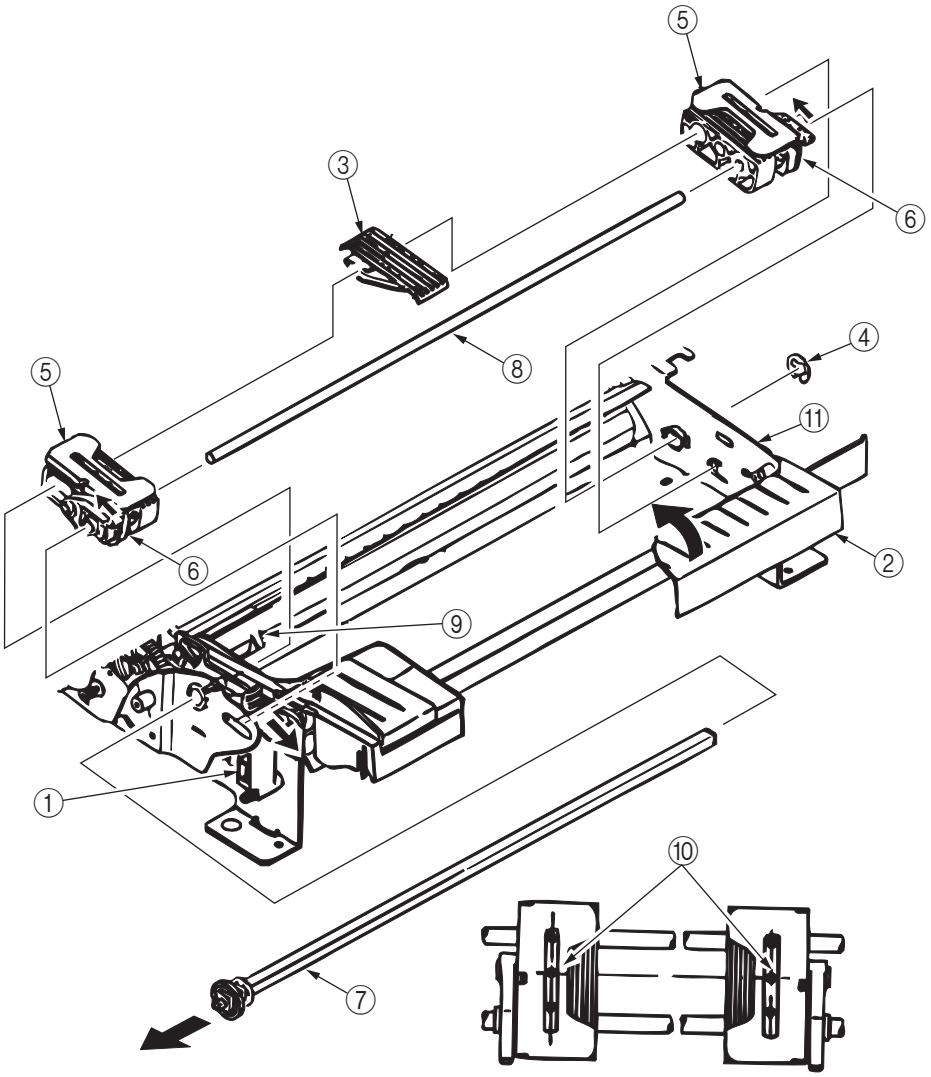
(4) Raise (unlock) the lock lever ⑥ of the left and right tractor assemblies ⑤. Slide out the tractor shaft ⑦ to the left.

(5) Take out the left and right tractor assemblies ⑤ together with the tractor guide shaft ⑧.

(6) Detach the left and right tractor assemblies ⑤ from the tractor guide shaft ⑧.

[Notes on installation]

- Mount the left tractor assembly further left than the bracket ⑨.
- When mounting the tractor shaft ⑦, match the left and right tractor assemblies ⑤ and the position of the sprocket-pin ⑩.
- Fit the tractor guide shaft ⑧ in the U-groove of the right side frame ⑪.



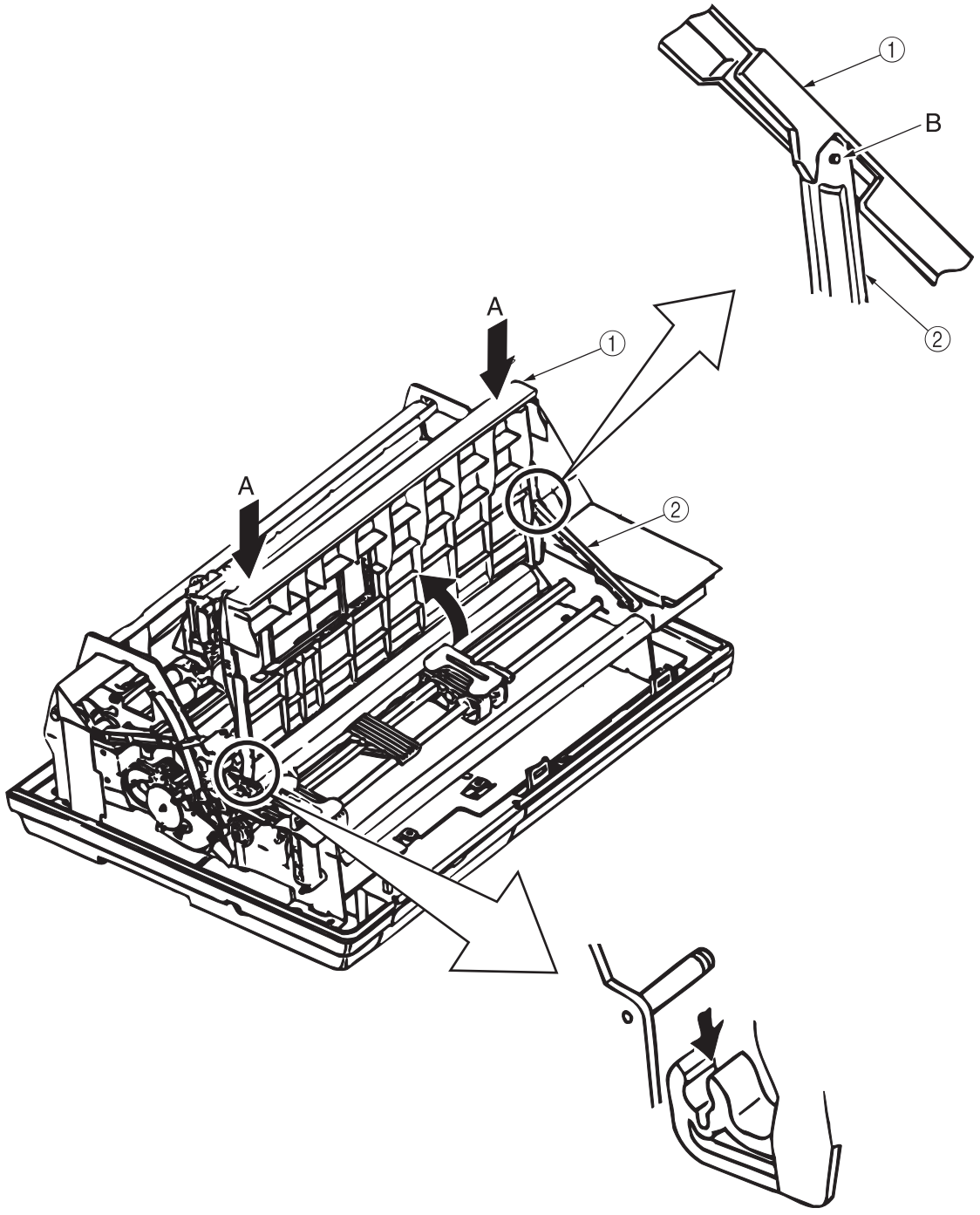
3.3.15 Table assembly

(1) Remove the upper cover assembly. (See 3.3.1)

(2) Open the table assembly ①.

(3) Push section A (two locations on left and right) until the fulcrum is unlocked.

(4) Remove the lock stay ② from the fulcrum B of the table assembly ①, then disengage the table assembly ①.



3.3.16 Feed roller spring

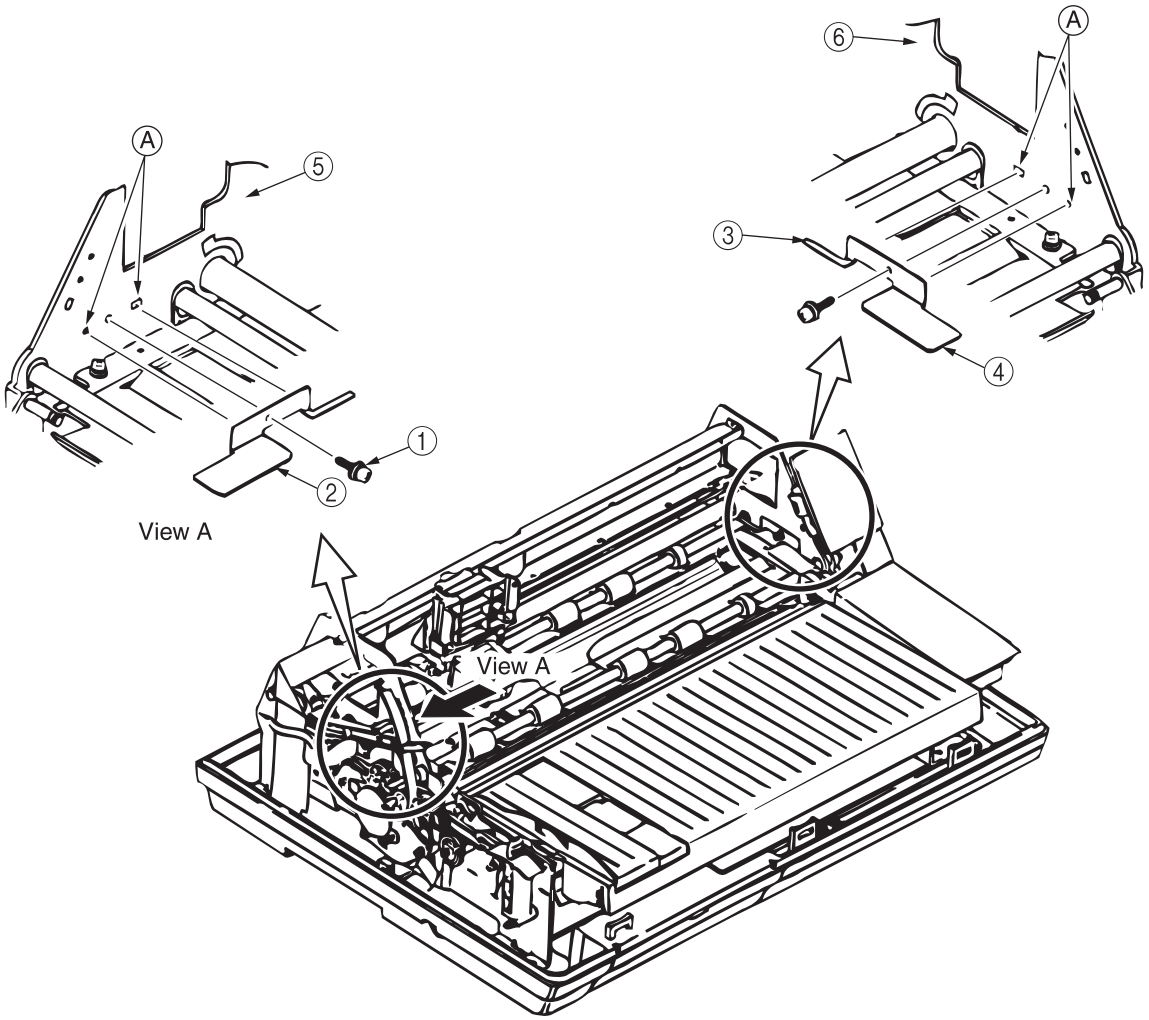
(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove screw ①, then remove the feed roller spring A ②.

(3) Remove screw ③, then remove the feed roller spring B ④.

[Notes on installation]

- Ensure that the feed roller springs A ② and B ④ are put firmly into holes Ⓐ of the side frames ⑤, ⑥, then fasten them with screws ① and ③.



3.3.17 Stacker shaft

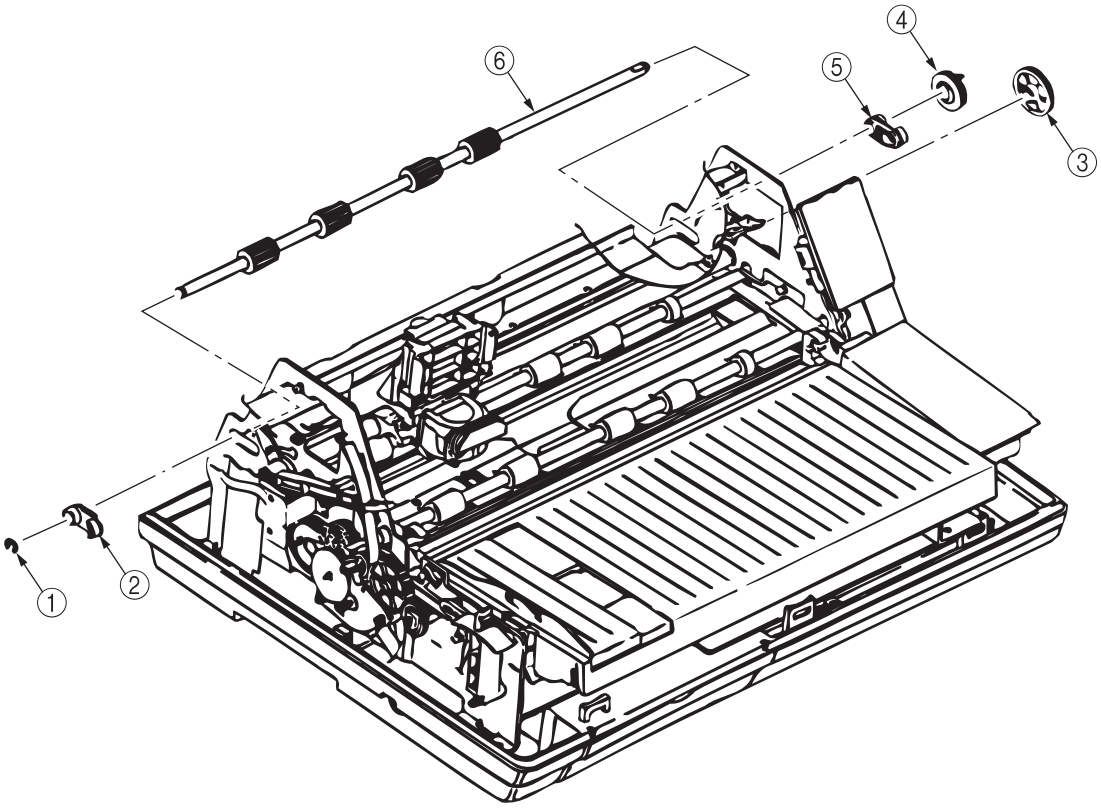
(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove E-clips ①, then remove the LF bush ②.

(3) Remove the idle gear B ③ (rear).

(4) Remove the stacker gear L ④, then remove the LF bush ⑤.

(5) Remove the stacker shaft ⑥.



3.3.18 Print head

[Note] *The print head is excessively hot immediately after printing. Wait until print head cools or use a protector to replace the printer head.*

(1) Lift the adjusting lever ① to open the access cover ②.

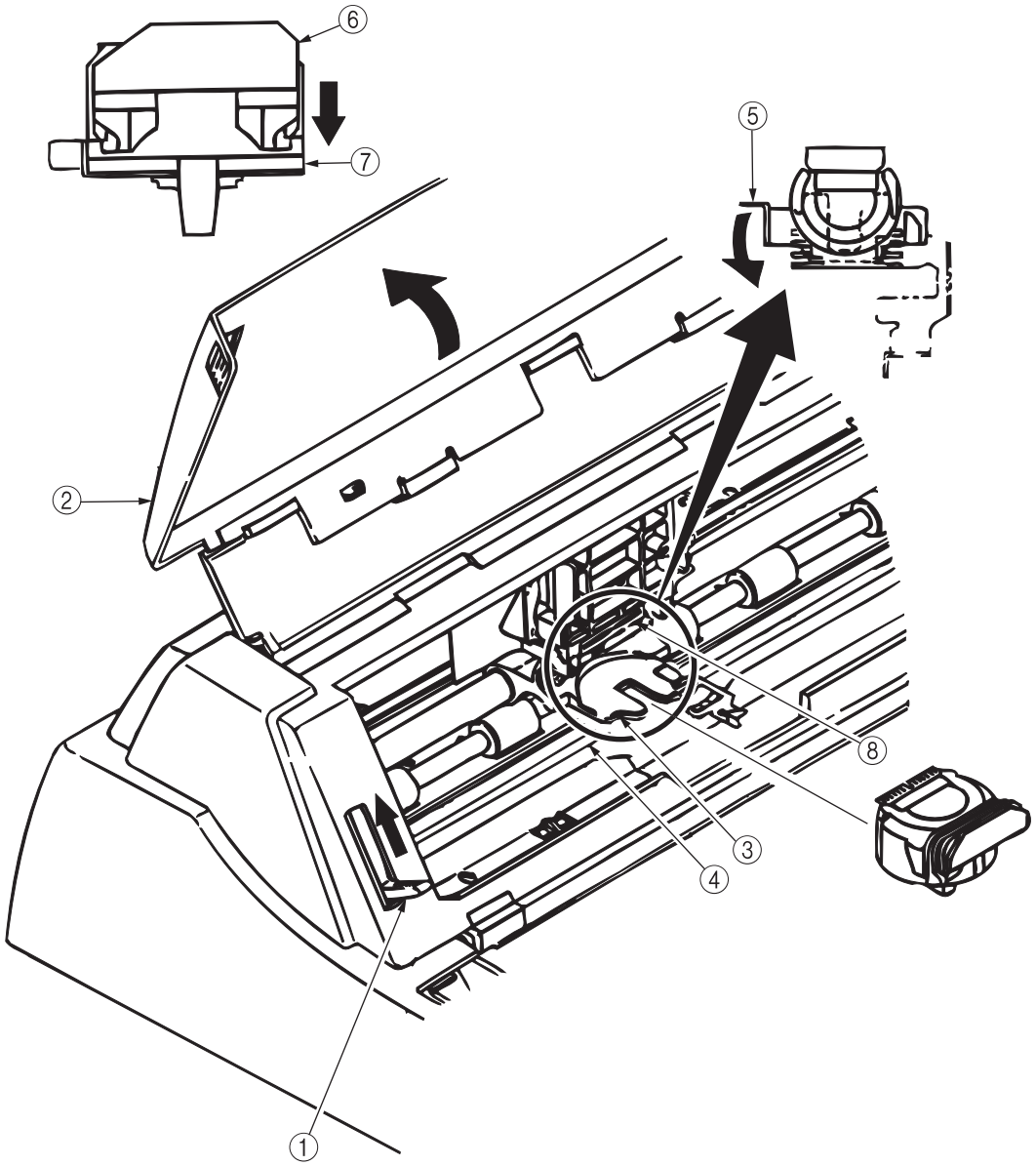
(2) Move the carriage unit ③ to the center of the notch of the upper sheet guide ④.

(3) Slide the head clamp ⑤ towards you and unlock the print head ⑥.

(4) Slide the print head ⑥ towards you to remove.

[Notes on installation]

- *Connect the connector ⑧ while bumping the print head ⑥ against the carriage frame ⑦.*
- *Firmly lock the head clamp ⑤ in between the print head ⑥ and the carriage frame ⑦.*



3.3.19 Ribbon feed gear assembly

(1) Remove the upper cover assembly. (See 3.3.1.)

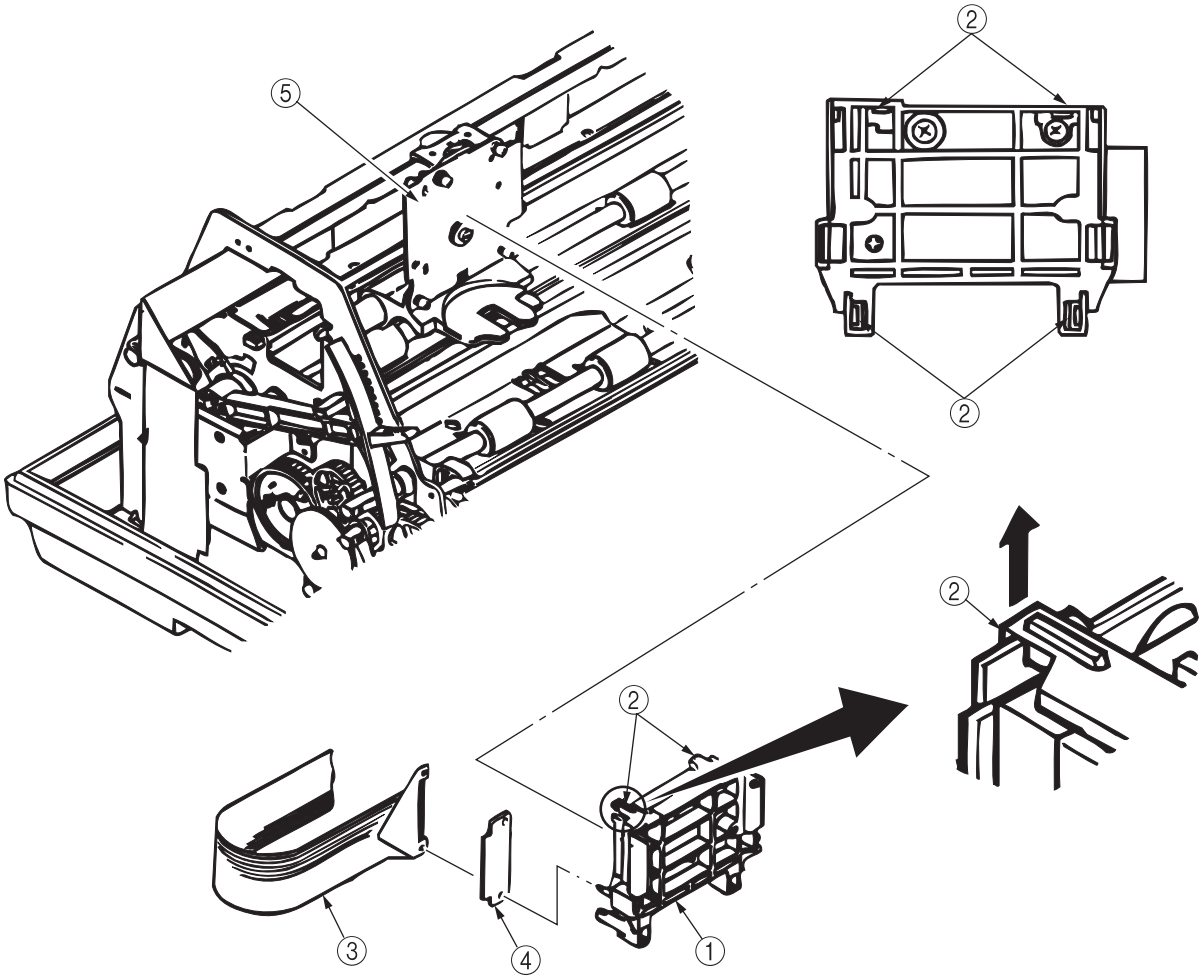
(2) Remove the print head. (See 3.3.18.)

(3) Unlock four claws ② and remove ribbon feed gear assembly ① with sliding it towards you. (Insert the flat-blade screwdriver into the hole to disengage the claw.)

(4) Remove the head cable ③, and contact pressure rubber ④ from the ribbon feed gear assembly ①.

[Notes on installation]

- *Do not touch the uncovered terminal (pressure welding point) of the space motor assembly ⑤ and head cable ③. Also, do not allow any dust to contact the uncovered terminal and head cable.*
- *Carefully handle the head cable ③ so that no folding marks are made.*



3.3.20 Space motor assembly

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the print head. (See 3.3.18.)

(3) Remove the ribbon feed gear assembly. (See 3.3.19.)

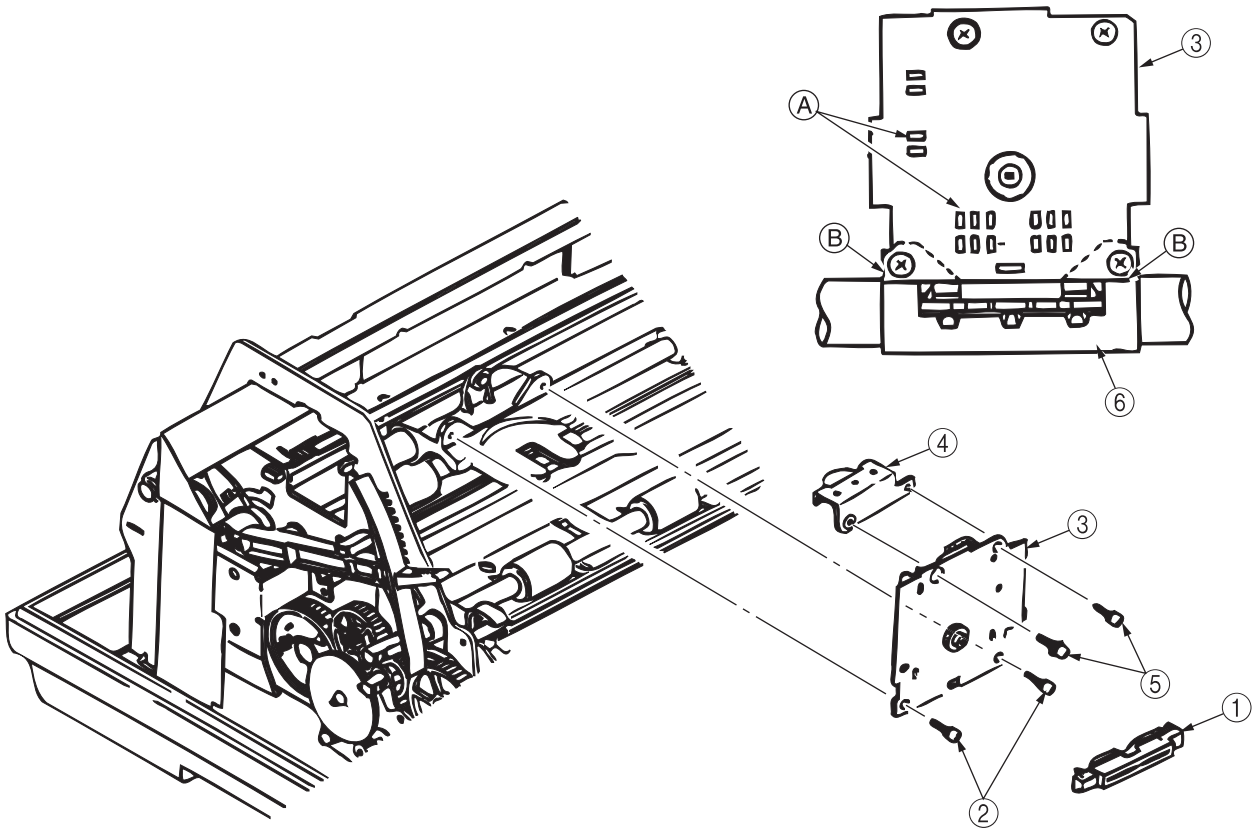
(4) Remove the connector ①.

(5) Remove two screws ② to remove the space motor assembly ③ together with the guide roller assembly ④.

(6) Remove two screws ⑤ to remove the guide roller assembly ④.

[Notes on installation]

- *Do not touch the uncovered terminal (pressure welding point) Ⓐ of the space motor assembly ③. Also, do not allow any dust to contact the uncovered terminal.*
- *When mounting the space motor assembly ③, make sure that its part Ⓑ touches the carriage frame ⑥.*
- *After mounting the space motor assembly, adjust the gap of the print head (See 4.1).*



3.3.21 Head cable

(1) Remove the upper cover assembly. (See 3.3.1.)

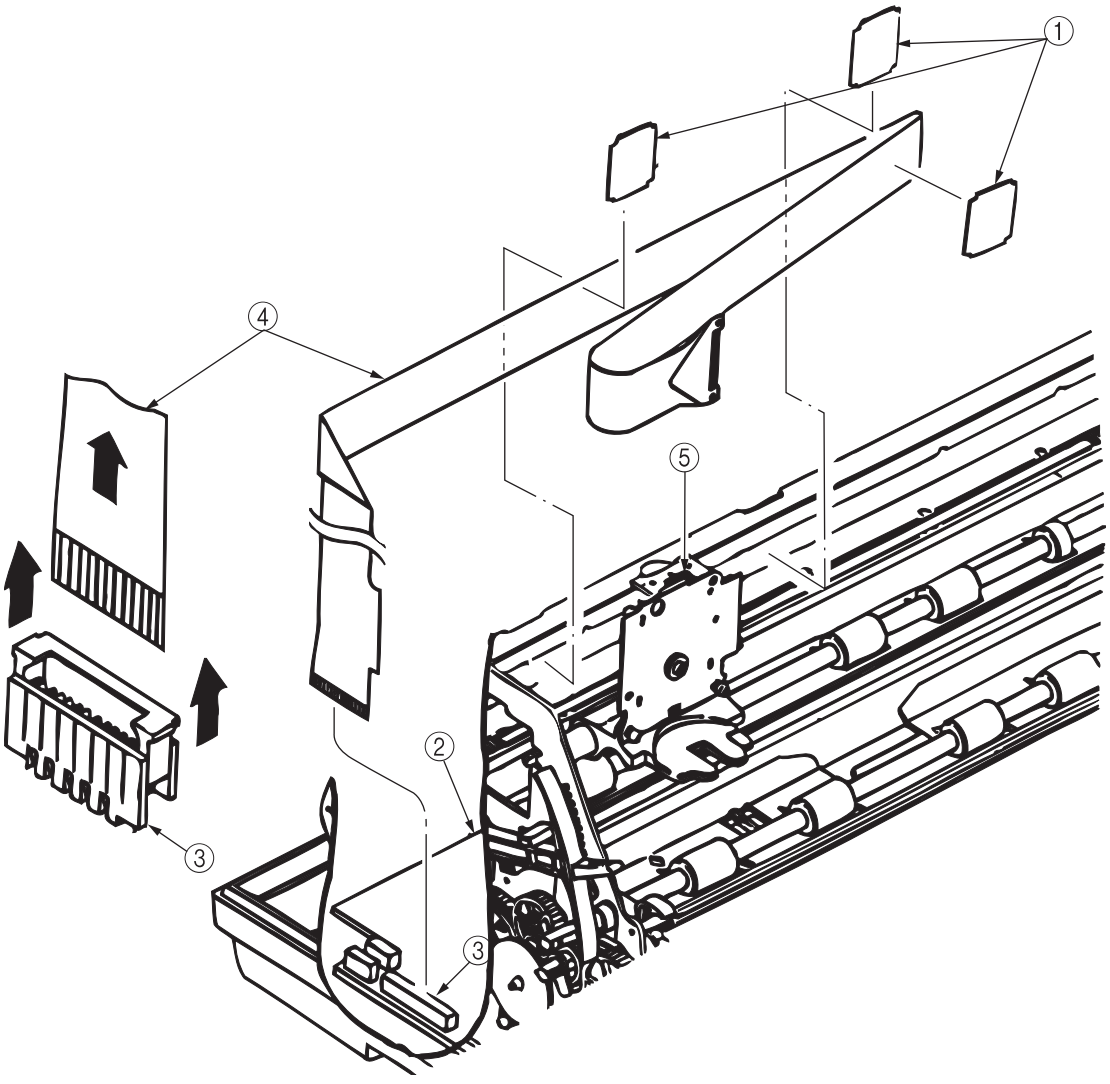
(2) Remove the ribbon feed gear assembly (See 3.3.19.)

(3) Remove three guide plates ①.

(4) Unlock the connecter (CN10) ③ of the Control board ② to remove the head cable ④.

[Notes on installation]

- *Do not touch the uncovered terminal (pressure welding point) of the head cable ④ and the space motor assembly ⑤. Also, do not allow any dust to contact the head cable and the uncovered terminal.*
- *Carefully handle the head cable ④ so that no folding marks are made.*



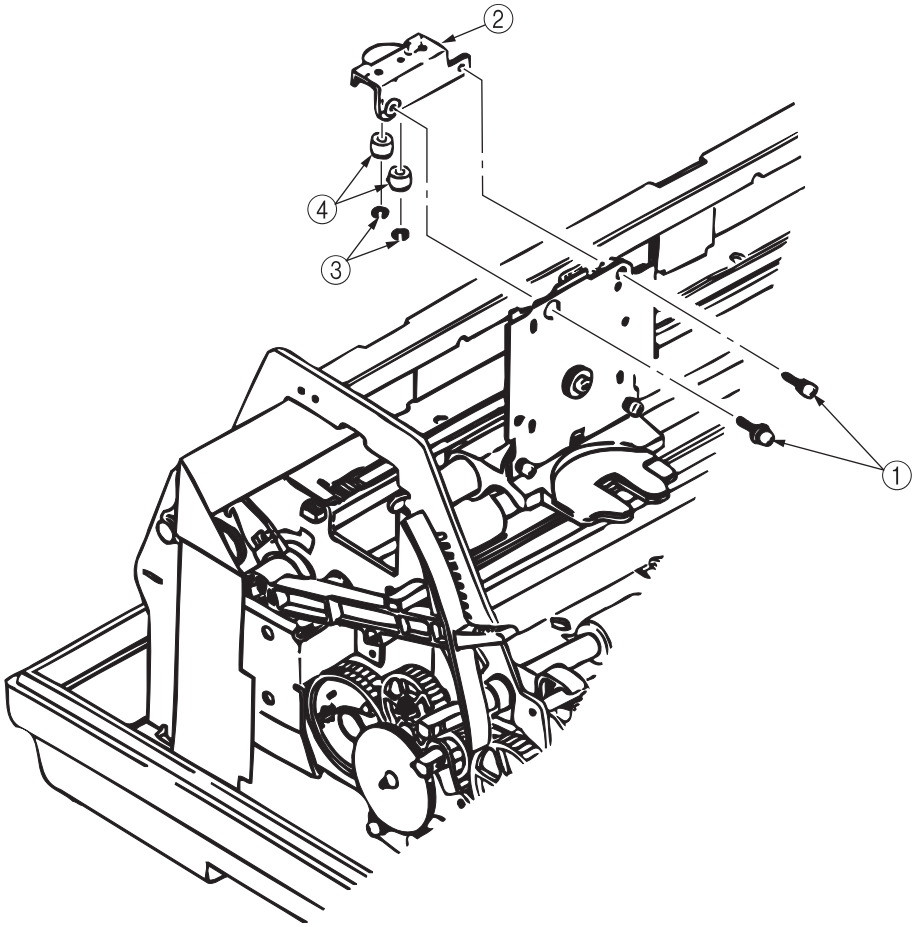
3.3.22 Guide roller

(1) Remove the upper cover assembly. (See 3.3.1.)

(2) Remove the ribbon feed gear assembly. (See 3.3.19.)

(3) Remove two screws ① to remove the guide roller assembly ②.

(4) Remove the E-clip ③ to remove the guide roller ④.



4. ADJUSTMENT

4.1 Gaps between Platen and Print Head

[Note] *Set the adjustment lever to range 1 before checking adjustment.*

(1) Adjustment value : 0.016 ± 0.001" (0.41 ± 0.03 mm)

(2) Adjustment positions : The left end, center, and right end of the platen

(3) Adjustment method : Rotate the left and right adjustment bushings.

[Adjustment procedure]

a. Set the adjustment lever to range 1.

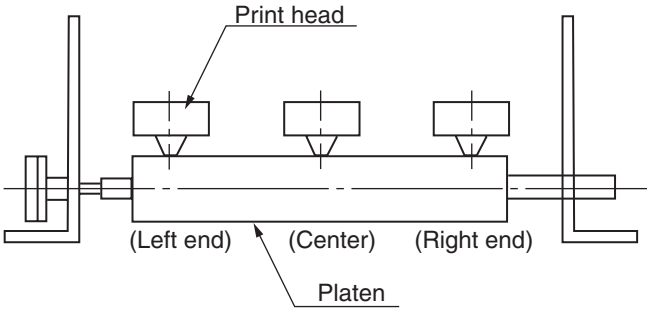
b. Set the left and right adjustment bushings to the initial position (marking).

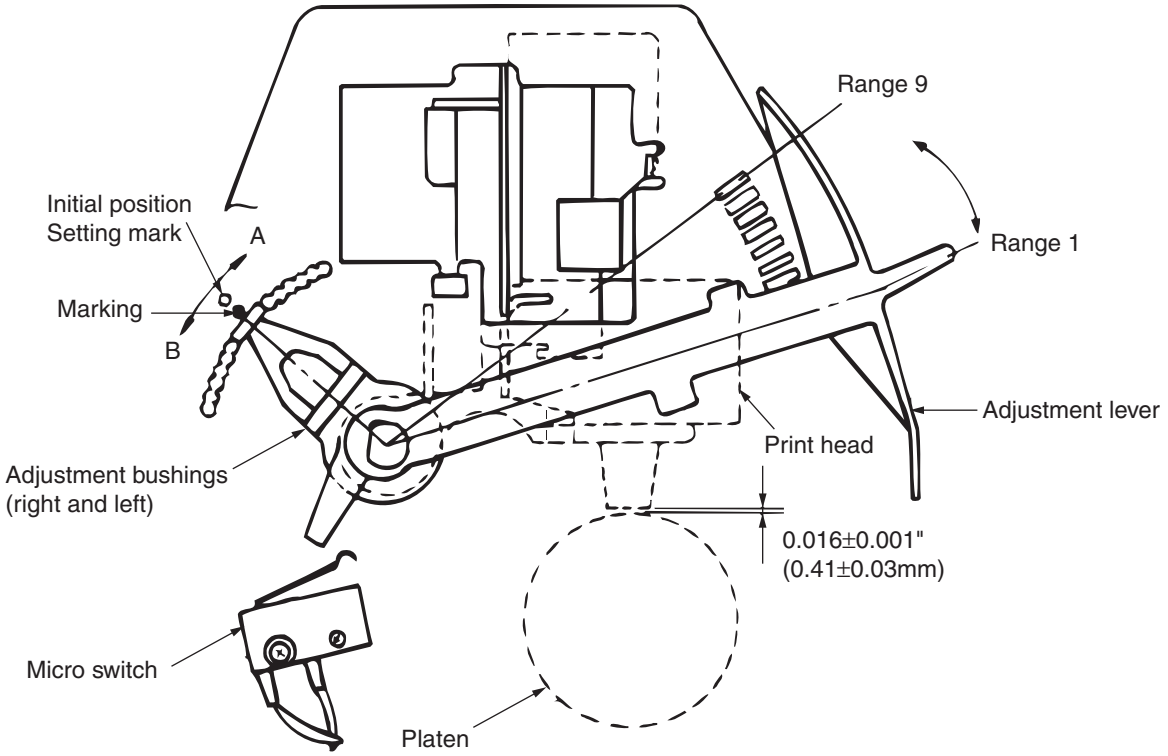
c. Put the adjustment lever to the left side frame. (Make sure there is no play between the adjustment lever and the groove.)

d. Keeping the condition described in C, slide the adjustment bushings in the A or B direction.

e. Confirm that the adjustment lever is set to range 9 and the gap is 0.032 ± 0.002" (0.81 ± 0.05 mm).

[Note] *Adjust the gaps at the left end, center, right end of the platen.*





4.2 Micro Switch Position

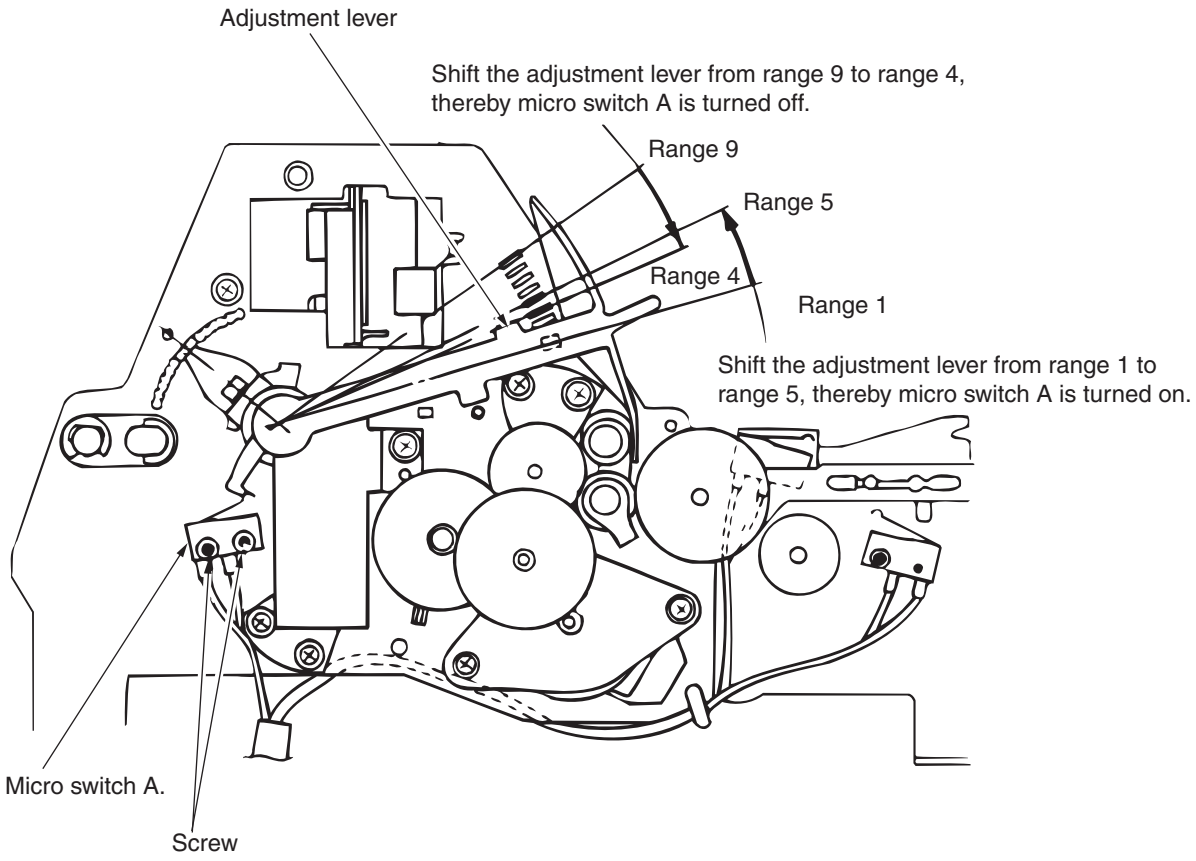
[Note] *Micro switch A is to be adjusted.*

(1) Adjustment value

- When the adjustment lever is shifted from range 1 to range 5, micro switch A is turned on.
- When the adjustment lever is shifted from range 9 to range 4, the micro switch A is turned off.

(2) Adjustment method

position micro switch A by loosening the screws.



5. CLEANING AND LUBRICATION

5.1 Cleaning

[Notes for cleaning]

- Before attempting to clean the printer turn off the POWER switch.
- Be careful so that no paper dusts enter the mechanical part.

[Area to be cleaned and cleaning period]

Follow the guidelines to clean the printer at the specified intervals.

- Cleaning period:

  Every six months or 300 operation hours, whichever comes first
- Required time:
  About ten minutes
- Tools to be used:
  Dry soft cloth (such as gauze, etc.), and vacuum cleaner (preferable)
- Cleaning area :

Table 5-1 Areas to be cleaned

Area to be cleaned	Contents of cleaning
Carriage shaft and its vicinity	Remove paper dusts, and wipe off any dirt, dust, and ribbon fibers
Paper path	

5.2 Lubrication

(1) Lubricant

- Pan motor oil 10W-30 (or its equivalent) -- PM
- Albania grease #2EP (or its equivalent) -- GEP

(2) Amount of lubricant

- A lot -- Ⓐ -- Plenty of lubricant
- Medium -- Ⓜ -- About 3 to 4 drops. Alternatively, add a 0.008" (0.2 mm) layer of grease.
- Little -- Ⓛ -- About one drop
- Very little -- (VL) -- No blot on the parts surface.

(3) Period of lubricant

This equipment is designed to be maintenance-free and oiling is unnecessary during operation.

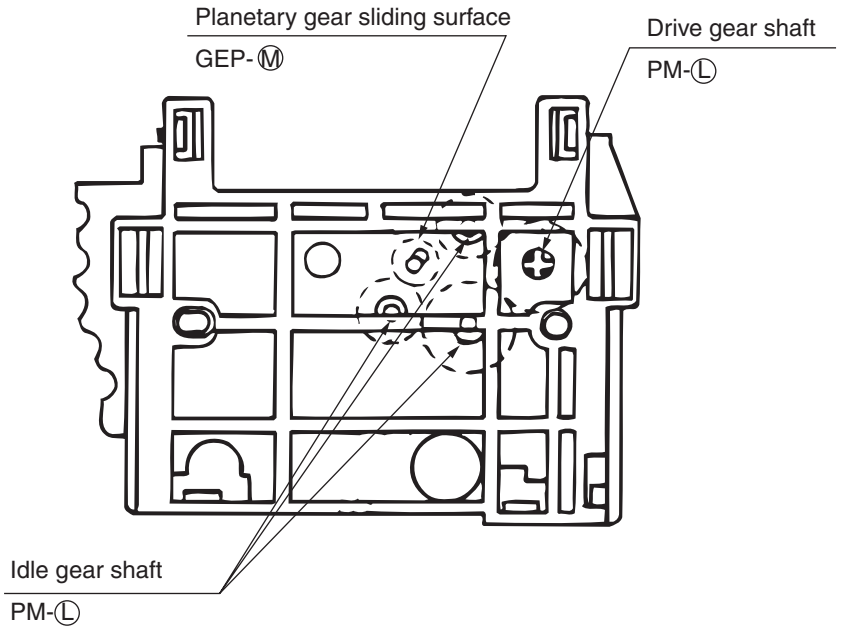
However, when reassembly or cleaning of oiled parts occurs, lubricant is required.

(4) Areas to avoid contact with lubricant

Item No.	Areas to avoid lubricant	Reason	Remarks
1	Ink ribbon	To prevent print characters from blurring	
2	Platen surface	To prevent paper from getting dirty	
3	Feed roller surface	To prevent paper from getting dirty	
4	Flexible cable	To prevent poor contact and cracks	
5	Motor board	To prevent poor contact	
6	Carriage shaft	To stabilize the load of carriage feeding	
7	Sensor	To prevent dust accumulation	
8	Micro switch	To prevent dust accumulation	
9	Stacker roller surface	To prevent paper from getting dirty	

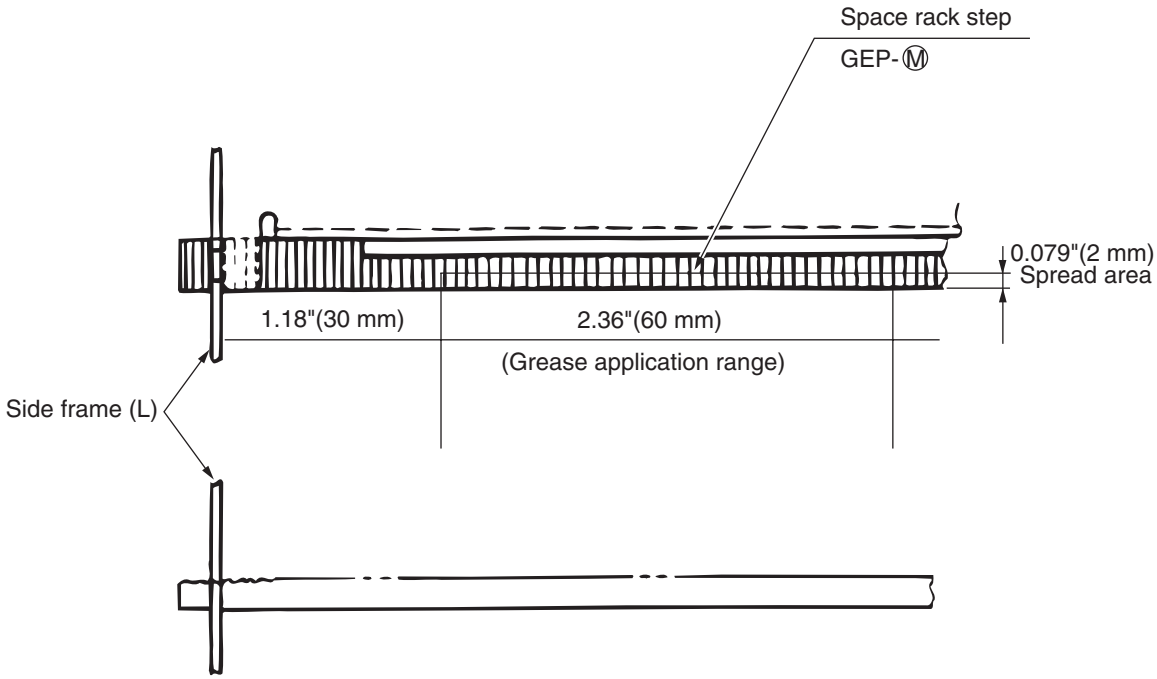
(5) lubrication points

a) Ribbon drive gear assembly

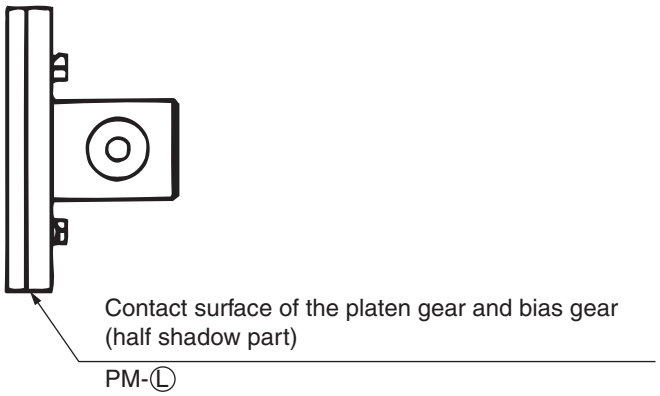


[Note] *The upper and lower ends of the gear shaft should be oiled.*

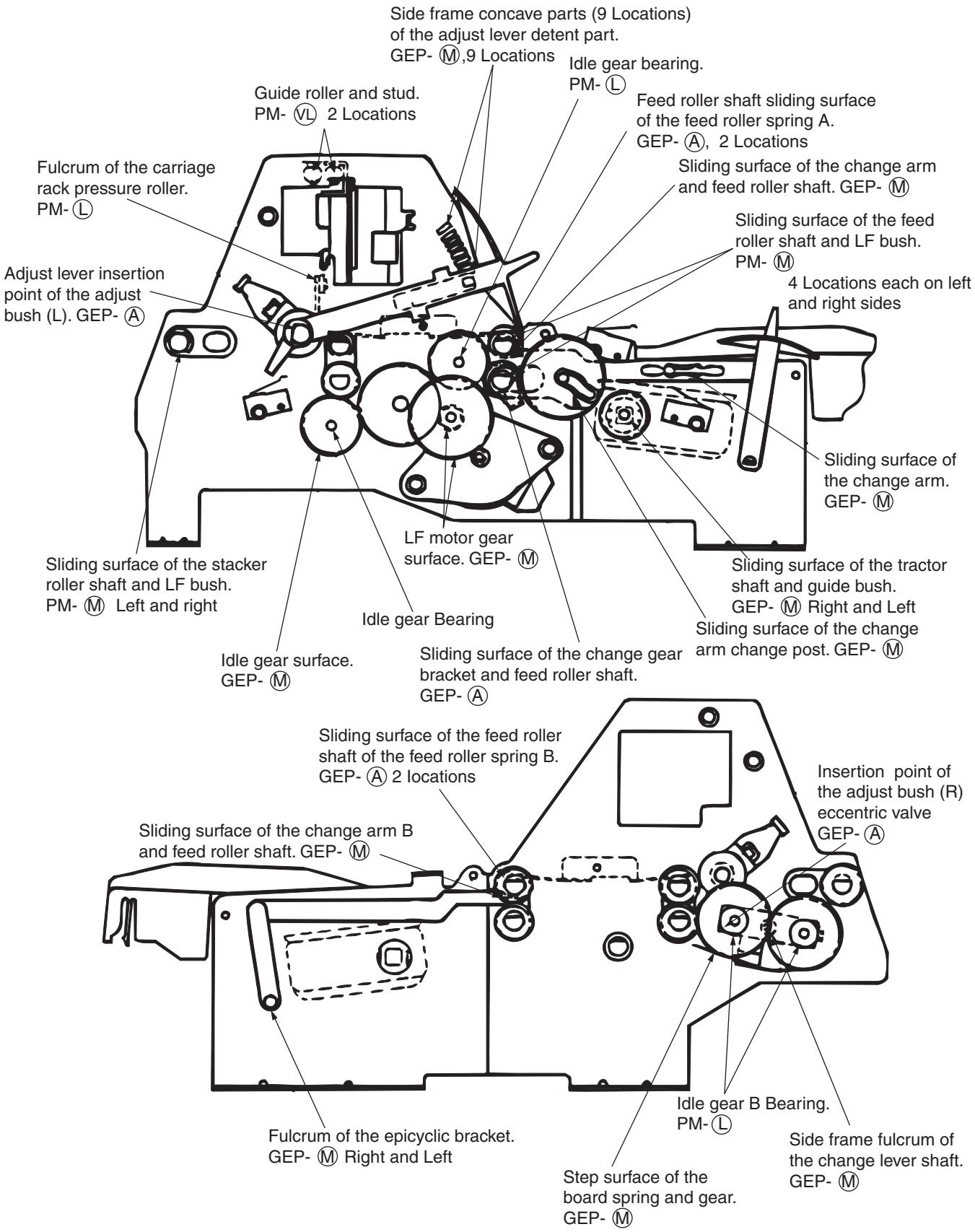
(b) Space rack



(c) Platen assembly



(d) Printer mechanism



6. TROUBLESHOOTING AND REPAIR

6.1 Items to Check before Repair

Before servicing the printer, ask the customer if possible under what conditions the trouble occurred, and record the customer's responses.

Before troubleshooting, set up the printer to operate under the same conditions as at the time the trouble occurred and check whether the trouble is reproducible. If the trouble is not reproducible, perform the printer's self test and thoroughly test the printers functionality. If the trouble is reproducible proceed to the troubleshooting section.

6.2 Method of Troubleshooting

Verify the problem and then locate the trouble in according to the detailed procedure given for each item in Table 6-1.

Before correcting the problem, thoroughly read the precautions in Section 3.1.

The checkpoints for the Control board and the Operation board are shown in Figure 6-1, 6-2. The connector locations and pin numbers are shown in Figure 6-3.

Table 6-1

Status	Details	Flowchart item No.
Trouble upon power on	• Power is not supplied. • Spacing operation does not operate normally.	① ②
Trouble during printing operation	• Wrong character, character or dot omission. • Line feed trouble • Malfunction of switch on operation panel. • Data receiving failure.	③ ④ ⑤ ⑥

6.3 Lamp Display

(1) Printer mode display

(2) Fault alarm display

When the printer detects a variety of alarm conditions, these alarm conditions are displayed using LEDs. Alarm condition status is displayed by the different MODE LEDs which are lit along with the POW LED and the flashing ALM LED.

The details are listed below.

Table 6-2

Printer mode		ALARM LED	SELECT LED	EJECT DIRECTION LED	Contents	Remarks
Normal operation mode	ON LINE	OFF	ON	Don't care	Indicates that the printer is ready to receive data and print.	
	HEX DUMP mode				Indicates that the printer is in hex dump mode.	
	LOCAL mode	OFF	OFF	Don't care	Indicates that the printer is in the local mode.	
	MENU mode	OFF	OFF	Don't care	Indicates that the printer is in the menu mode.	
Operator alarm condition	Paper end	ON	OFF	Don't care	Form end, single sheet end, or bottom paper end	
	Paper jam				SASF paper jam	
	CSF paper jam				Paper jam or paper end, when CSF is installed	
	Print suppress	OFF	BLINK	Don't care	Indicates that the printer is in the print suppress mode.	
	CSF detach alarm	ON	OFF	BLINK	Indicates that the printer is in the CSF detach alarm mode.	
	Continuous -to- cut-sheet switching alarm				Indicates that the printer is in the continuous-to-cutsheet switching alarm mode.	
Internal fault alarm condition		BLINK	OFF	Don't care		

Table 6-3

Error condition	Lit mode LED besides POW and flashing ALM LED	Contents
Memory error	10, COURIER	MPU internal RAM error
	12, COURIER	Program ROM error
	12, ROMAN	EEPROM error
	10, 20, COURIER	External RAM error
	12, SWISS	Resident CG error
	20, SWISS	Resident CG release
Spacing error	12, PROP, COURIER	HEAD HOMING error
	12, PROP, ROMAN	Spacing error

*PROP: PROPORTIONAL

Table 6-4

Alarm	LEDs				Comment
	Primary Message			Detail Message	
	Menu	ALARM	SEL		
Paper Out	Current mode	on	off	Current CPI	alarm occurs 1/6"(4.35mm) from bottom edge
Printhead Temp	BLINK	off	on	Current CPI	after cool down, continues to print

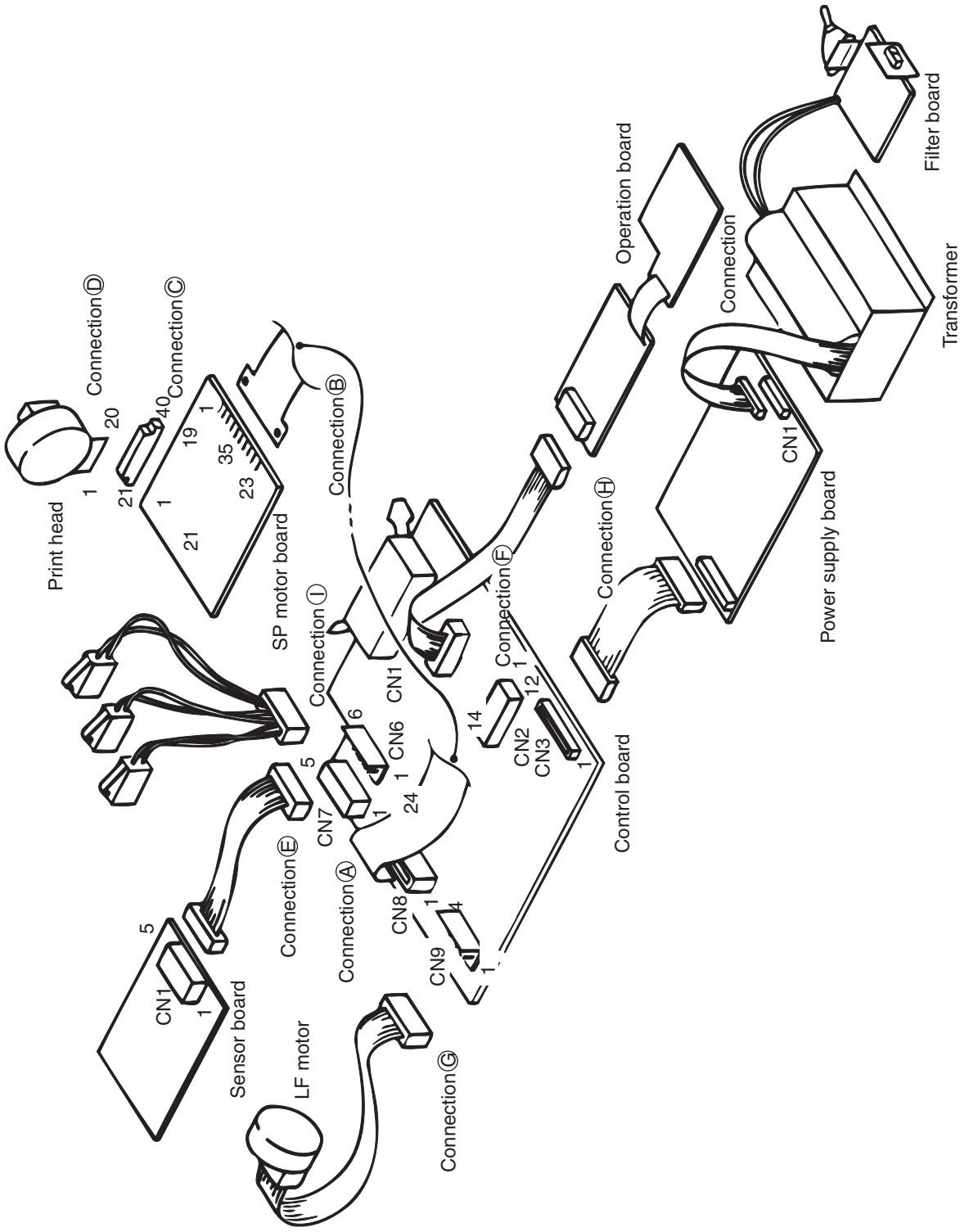


Figure 6-3 Connection locations and pin numbers

Table 6-5 Pin numbers and signal names (1/2)

Name	Signal Name	Connection					Coil resistance	Figure
		A	B	C	D	E		
PRINT HEAD	ODD EN	13,15	13				Approx. 18.3Ω	Contact on the printhead
	EVEN EN	13,15	15					
	COMMON	3-6	5,6	14,15				
				30,31				
			3,4	6,7,				
				26,27				
	TSD	10	10	20				
	S CLOCK	11	11					
	S DATA	14	14					
	+ 40V FB	23	22					
	0V	12	12	36				
	+ 5V	16	16					
	EP	19-22	19-22					
	#1			2	2			
	#2			19	19			
	#3			3	3			
	#4			18	18			
	#5			22	22			
	#6			35	35			
	#7			23	23			
	#8			34	34			
	#9			4	4			
	#10			17	17			
	#11			5	5			
	#12			16	16			
	#13			24	24			
	#14			33	33			
	#15			25	25			
	#16			32	32			
	#17			8	8			
	#18			13	13			
	#19			9	9			
	#20			12	12			
	#21			10	10			
	#22			11	11			
	#23			28	28			
	#24			29	29			
Sensor PCB	PAPER END					2		
	TABLE SENSE					1		
	0V					4,5		
	+5V					3		

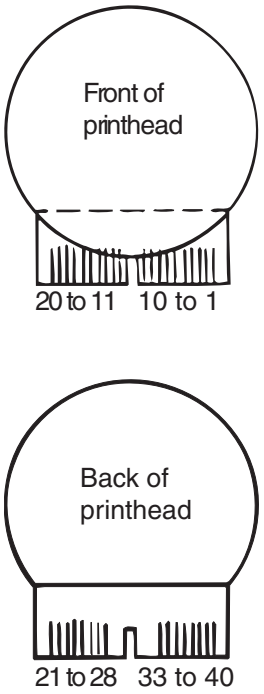
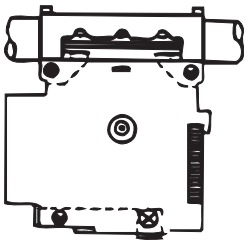
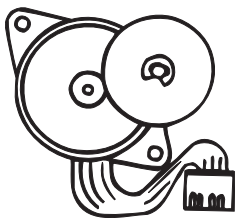


Table 6-5 Pin numbers and signal names (2/2)

Name	Signal Name	Connection						Coil resistance	Figure
		A	B	F	G	H	I		
SP MOTOR	V	7	7					Approx. 21Ω	Contacts on the SP motor 
	U	8	8						
	W	9	9						
	ΦA	18	18						
	ΦB	17	17						
OPERA-TION PANEL	ED SW			13					
	SEL SW			9					
	MODE SW			5					
	LF SW			1					
	FF SW			2					
	PARK SW			3					
	TOF SW			4					
	PRINT SW			11					
	FRONT SW			12					
	CHAR SW			10					
	LAMP SD CLK			8					
	LAMP SD			7					
	+5V			6					
	0V			14					
LF MOTOR	Φ1				2			Approx. 8.7Ω	Contacts on the LF motor 
					1				
	Φ2				3				
					4				
POWER	+40V					1,2,3			
	EP					4,5			
	+5V					6,7			
	0V					8,9			
	+8V					10			
	AC 10V					11			
	ALM					12			
MS Ass'y	CSF CONNECT						2		
	HEAD GAP						6		
	CUT SHEET						4		
	0V						1,3,5		

① No power

- Are AC cables being connected correctly?

YES

NO

- Connect the AC cables correctly.

- Is the AC fuse open on the primary side of the Filter board?

NO

YES

- Replace the Fuse.

- Are +5V and +40V supplied to the Control board?

  +5V : Measurement can be taken between CN4 1pin and CN4 15pin (Control board).

  +40V : Measurement can be taken between F1 and D8 Anode (Control board).

YES

NO

- Is the Fuse F1 open on the Power supply board?

NO

YES

- Replace Fuse F1.

- Is the connector cord connected to CN3 (Control board) or CN2 (Power supply board) correctly?

YES

NO

- Connect the connector cord to CN3 (Control board) or CN2 (Power supply board) correctly.

- Replace the Power supply board. (see Section 3.3.6)

- Replace the Control board. (see Section 3.3.4)

② Space operation does not operate normally

- Is the carriage assembly moving erratically or jammed?

YES

NO

- Check around the carriage assembly and Space motor and repair the mechanism.

- Are +5V and +40V supplied to the Control board?

YES

NO

- Is the connector cord connected to CN3 (Control board) or CN2 (Power supply board) correctly?

NO

YES

- Replace the Power supply board. (see Section 3.3.6)

- Connect the connector cord to CN3 (Control board) or CN2 (Power supply board) correctly.

- Is CN2 contact connection normal?

YES

NO

- Reset the Control board. (see Section 3.3.4)

- Replace the Control board (see Section 3.3.4).
- Is condition corrected?

YES

NO

- Replace the Space motor. (see Section 3.3.20)

- END

③ Wrong character, character or dot omission

- Is the head cable inserted into CN8 of the Control board correctly?

YES

NO

- Reset the head cable to CN8 correctly.

- Replace the Printhead. (see Section 3.3.18)
- Is condition corrected?

YES

NO

- Replace the Control board. (see Section 3.3.4)
- Is condition corrected?

NO

YES

- END

- Is the Space motor board contact normal?

NO

YES

- Reset the head cable.

- Replace the Space motor. (see Section 3.3.20)

- END

④ Line feed trouble

- Rotate the platen knob.
- Does the platen rotate smoothly?

YES

NO

- Switch the paper release lever to the continuous forms or cut-sheet.
- Does the platen rotate smoothly?

NO

YES

- Reinstall paper
- Ensure no foreign matter or dust is present on the platen gear, idler gear or drive gear.
- Ensure smooth meshing of the platen gear, idler gear and drive gear.
- Ensure correct operation of the push tractor assembly (R) or (L).
- Replace the push tractor assembly (R) or (L).

Is LF motor cable connected with Control board correctly?

YES

NO

- Connect it correctly.

Replace the Control board. (see Section 3.3.4)

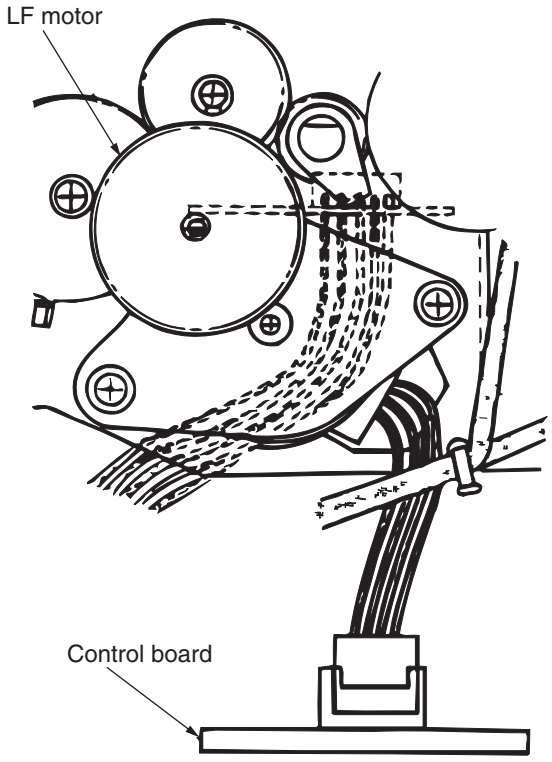
- Remedied?

YES

NO

- Replace the LF motor. (See Section 3.3.22)

END



⑤ Malfunction of switch on operation board

- Is the Operation board inserted into CN2 correctly?

YES

NO

- Connect it correctly.

- Replace the Operation board. (see Section 3.3.13)
- Is condition corrected?

YES

NO

- Replace the Control board. (see Section 3.3.4)

END

⑥ Data receiving failure

- Is the SELECT lamp on?

YES

NO

- Set to SELECT mode.

- Is the interface cable connected correctly?

YES

NO

- Connect it correctly.

- Replace the Control board. (see Section 3.3.4)

APPENDIX A PCB LAYOUT

(1) Control board

(2) Operation board

(3) Sensor board

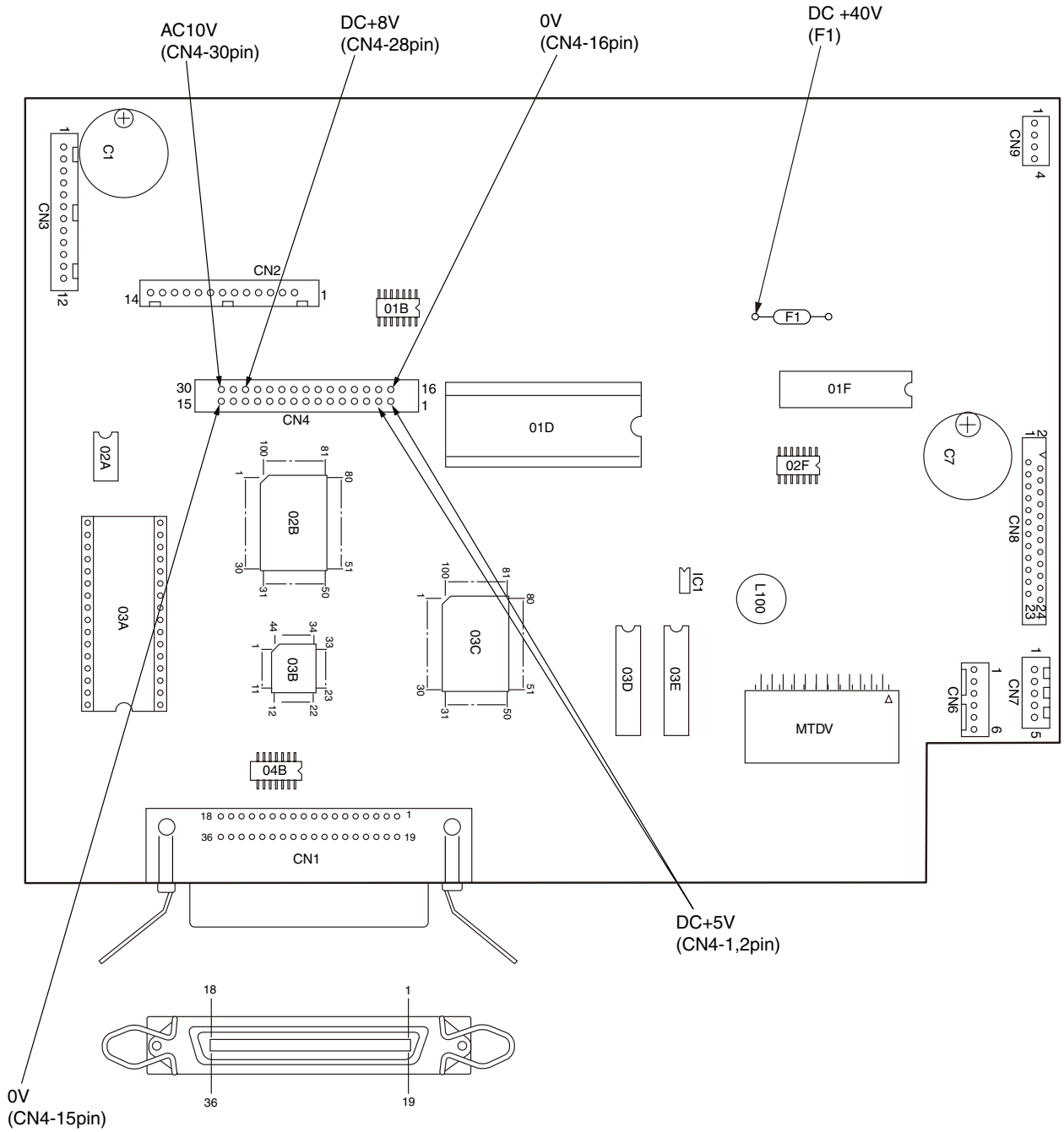


Figure A-1 Check points on the Control board

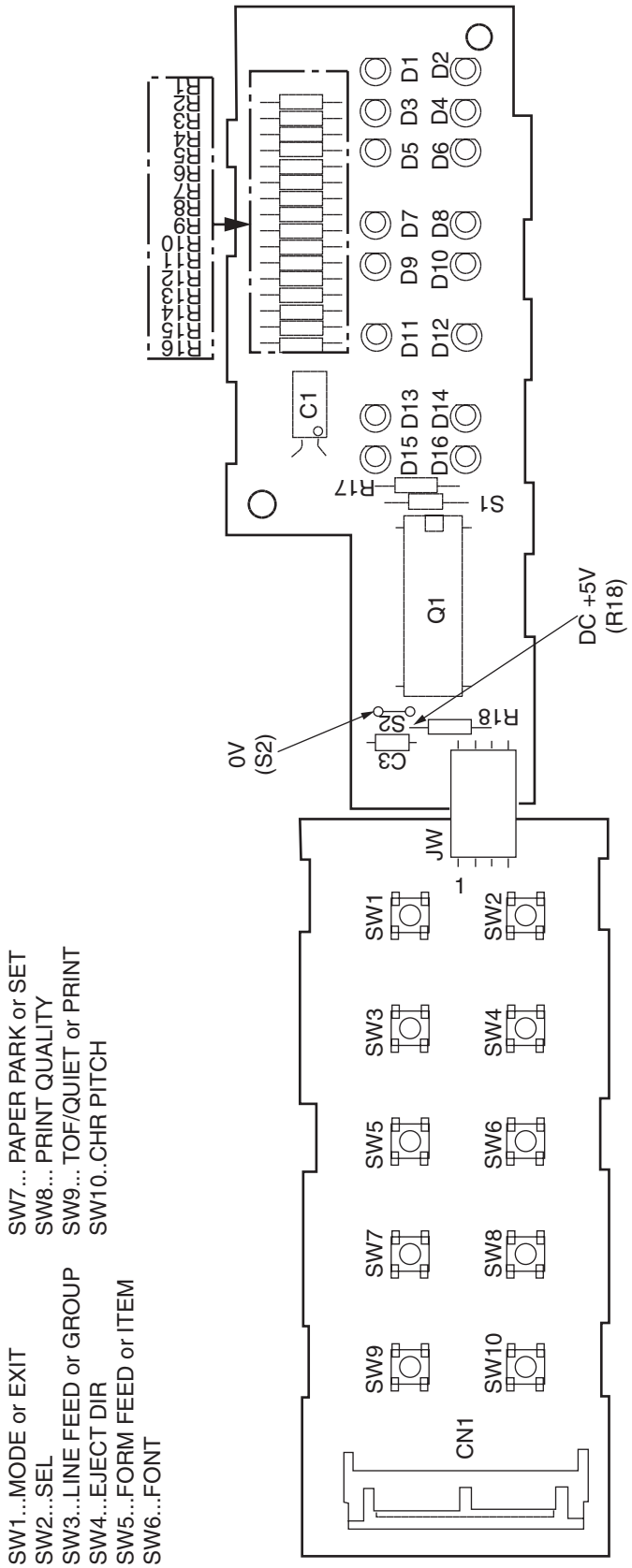


Figure A-2 Check points on the Operation board

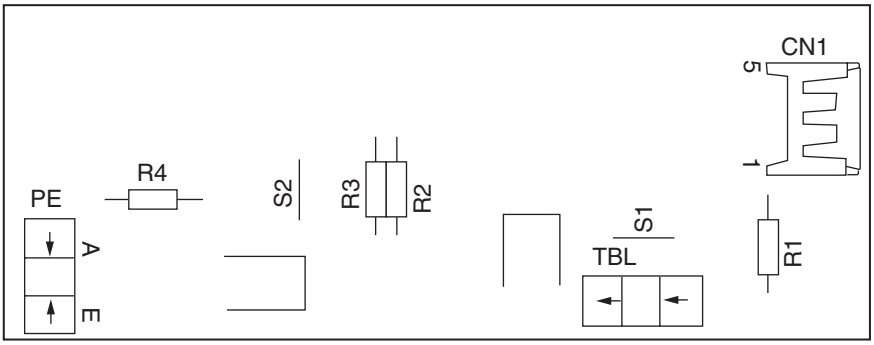


Figure 6-3 Sensor board

APPENDIX B RS-232C SERIAL INTERFACE BOARD (OPTION)

1. GENERAL

This section describes the operation of the RS-232C Serial Interface board installed in the Printer as an option using a start-stop synchronization and serial communications circuit. This serial interface board is capable of transmitting and receiving simultaneously at speeds up to 19,200 bits per second. Two protocols are available: Printer Ready/Busy and X-ON/X-OFF modes.

2. OPERATION DESCRIPTION

2.1 Element Description

(1) 80C51 with MASK ROM

An eight-bit microprocessor controller that controls the following:

(a.) Serial interface protocol and data transfer through a serial port.

(b.) Message buffer.

(c.) Transmission of parallel data to the printer.

(2) SN75189

An RS-232C standard line receiver.

(3) SN75188

An RS-232C standard line driver.

(4) 2764 (Not mounted. The control program is masked in the 80C51 internal ROM.)

An 8 kbyte ROM that contains the serial interface control program.

(5) HM6264

An 8192-byte static RAM used as a message buffer.

2.2 Circuit Description

A block diagram is shown in Figure B-2-1.

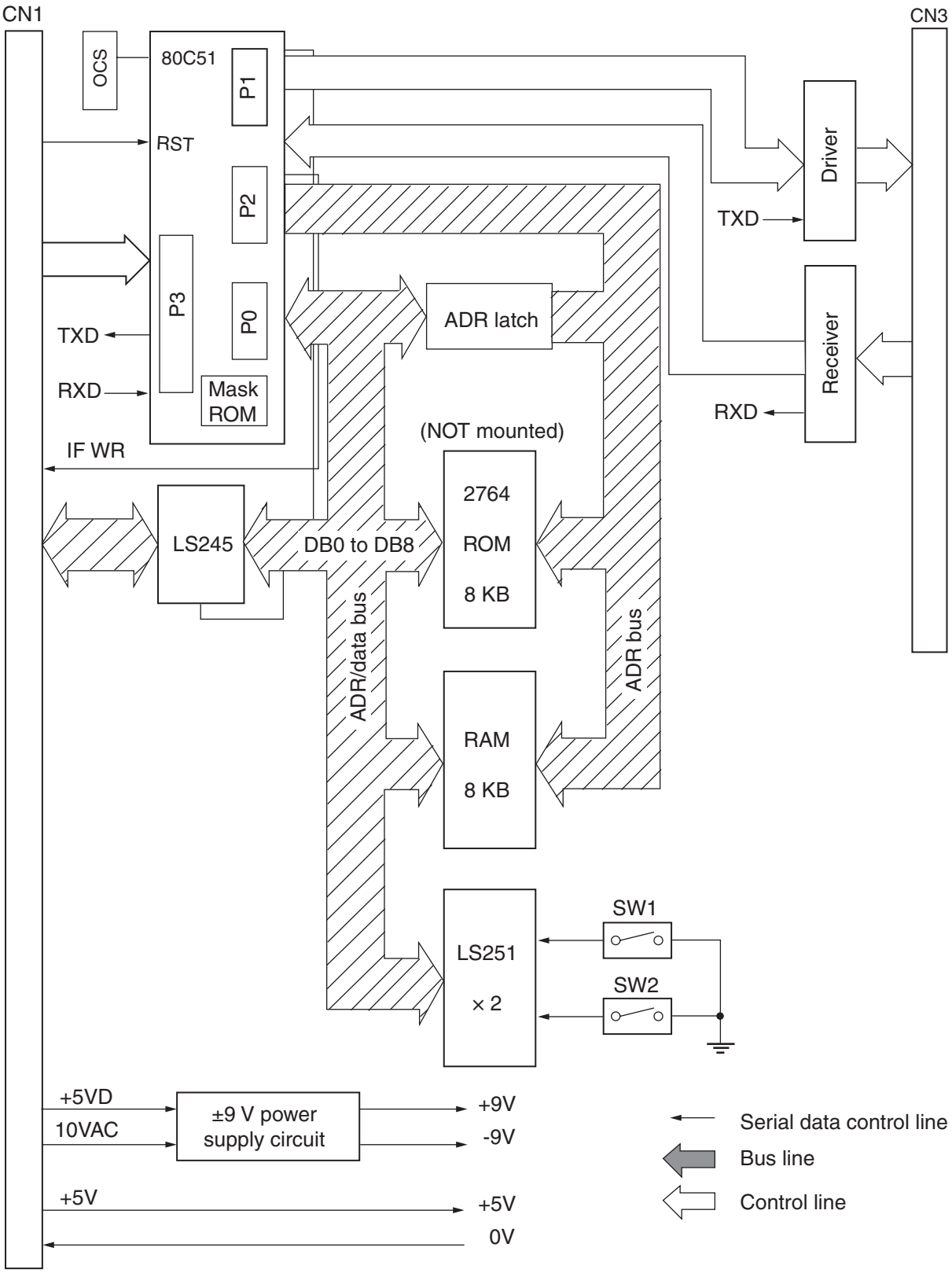


Figure B-2-1 Block diagram

2.2.1 Operation at power on

After power is turned on, an RST OUT signal is sent from the printer control board to reset the printer. When the reset is canceled, the 80C51 CPU performs initialization. Initialization consists of setting the 80C51 timer, and setting the serial mode.

2.2.2 RS-232C interface

The DTR, SSD, TXD and RTS signals output by the 80C51 are converted to RS-232C signals by line driver SN75188 and sent to the interface.

In addition, signals DSR, CTS, CD, and RXD on the RS232C interface are converted to TTL level by line receiver SN75189 and input to the 80C51.

2.3 Communication Procedure Flowchart

2.3.1 Mode ⓐ

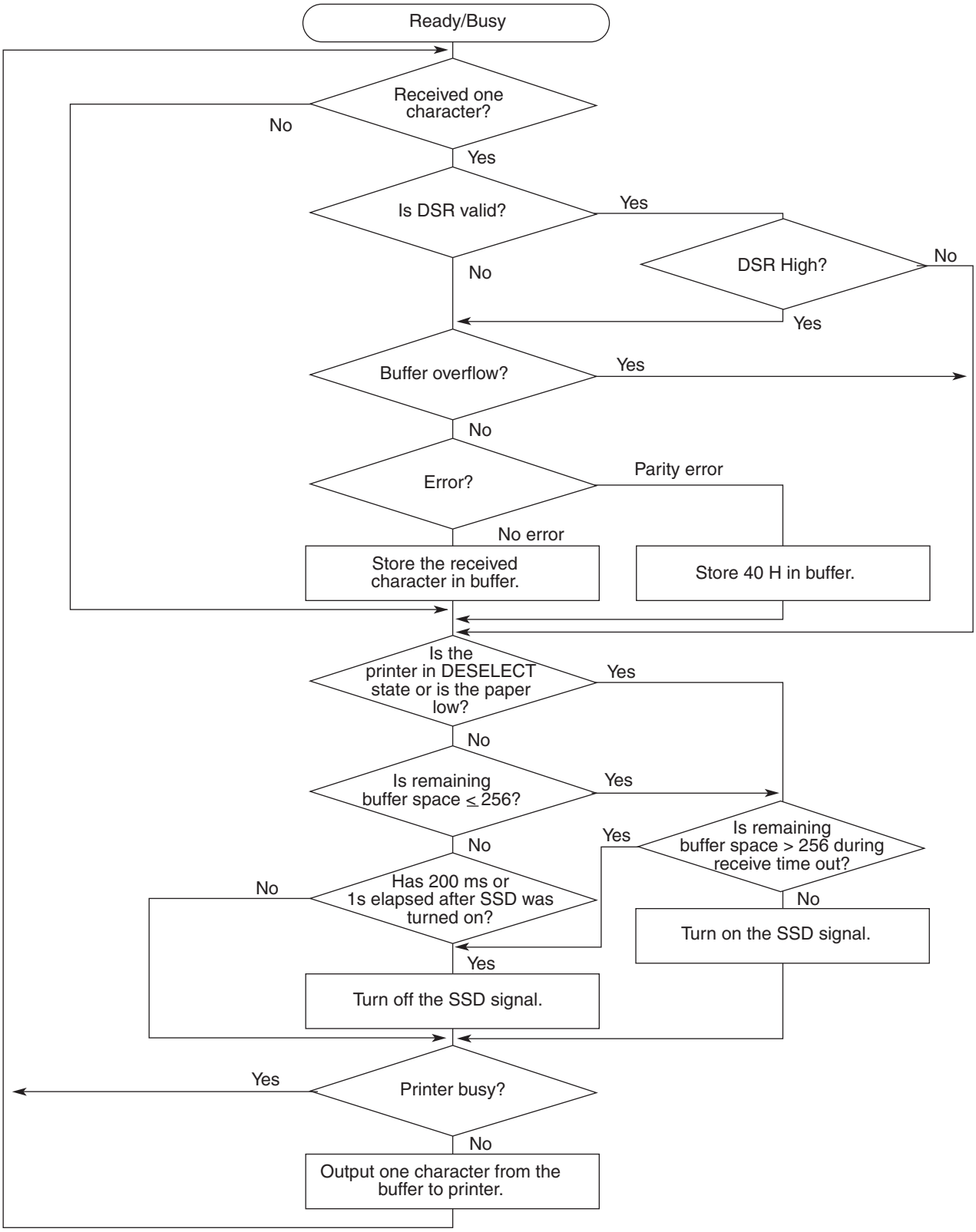


Figure B-2-2

2.3.2 Mode ⓑ

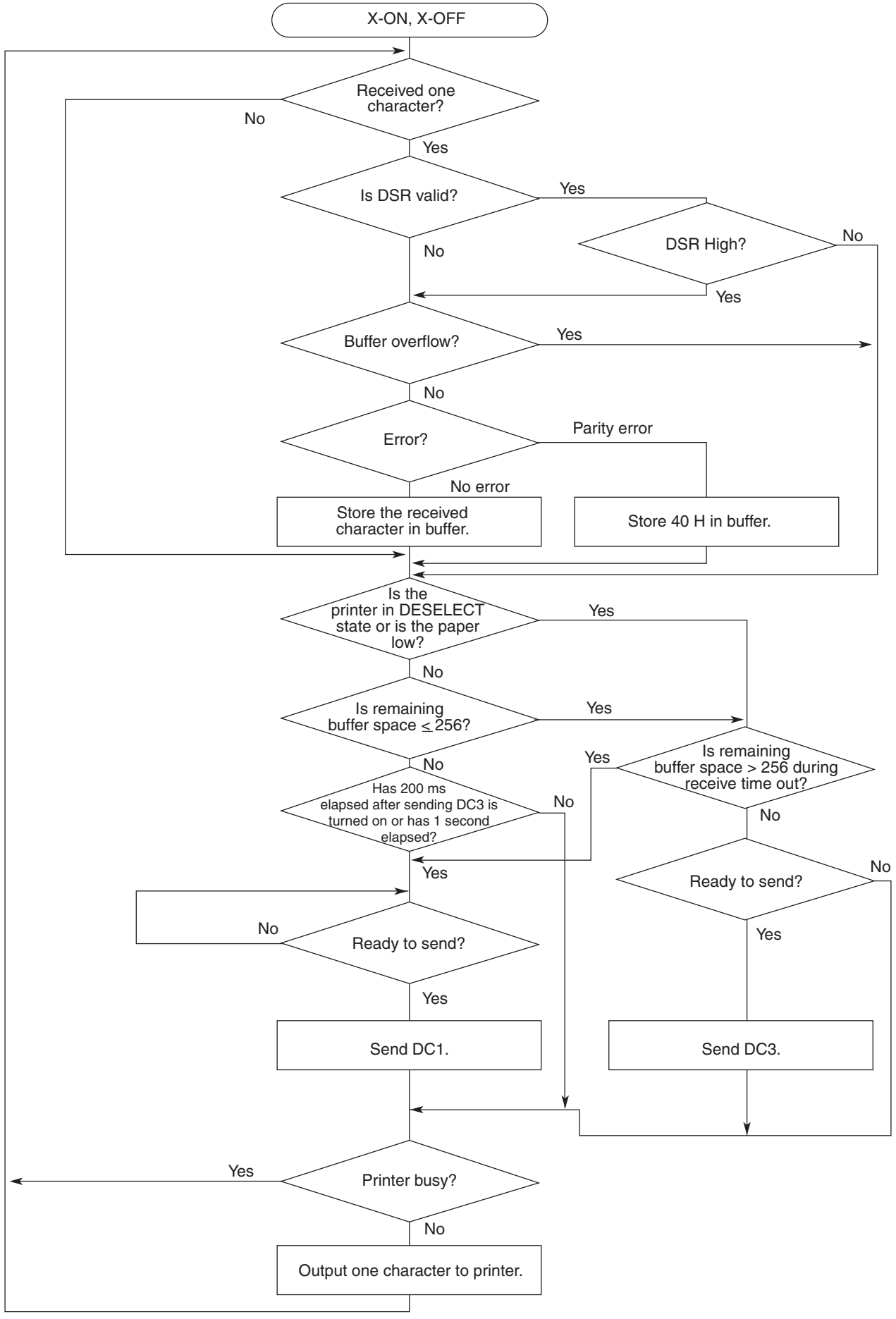


Figure B-2-3

3. TROUBLESHOOTING FLOWCHART

3.1 Before Repairing a Fault

Before servicing the printer, ask the customer in what situation the trouble occurred and record the response.

Before starting troubleshooting, operate the printer in the same situation as that at the time of trouble occurrence to see if the same trouble occurs again. If not, perform the printers self test and thoroughly test the printers functionality. If the trouble is reproducible proceed to the troubleshooting section.

3.2 Troubleshooting

(1) The data is not received using a serial interface.

(2) Using a serial interface, the print data is omitted or the print operation is not performed.

① The data is not received using a serial interface.

(A protocol is set to READY/BUSY state, and BUSY LINE is in SSD + state.)

- Is the OSC oscillation waveform as specified in Figure B-3-1?

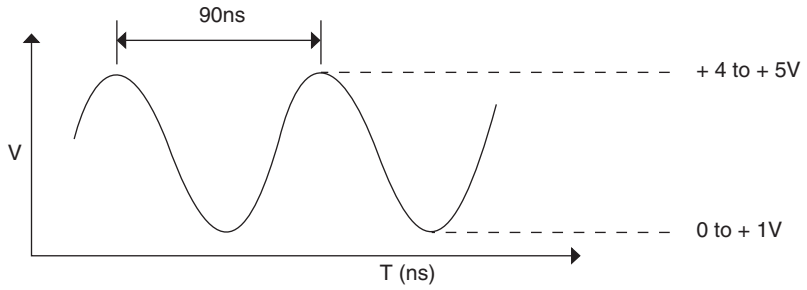


Figure B-3-1

- No Replace the OSC.

- Yes Is a RST signal in 01C is as specified in Figure B-3-2?

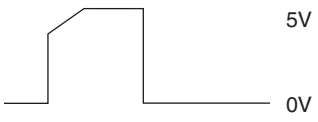


Figure B-3-2

Ⓐ
- No Check the RST circuit on the Control board.

Ⓐ • Yes Are ALE, $\overline{PSEN}$, $\overline{RD}$, $\overline{WR}$, signals as specified in Figure B-3-3?

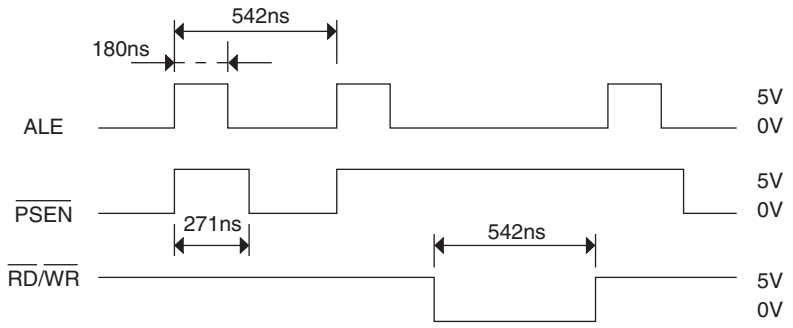


Figure B-3-3

- No Replace the 01C.

• Yes Are (T1) $\overline{SELECT}$ and (INTO) $\overline{BUSY}$ signals low level?

- No Check 02B on the Control board.

• Yes Are +9V and -9V input to 06D?

- No Replace defective component in +9/-9 volt Control board.

• Yes Is pin 6 SSD signal of 01C High level?

- No Replace the 01C.

• Yes Is pin 11 SSD of 06D low level?

- No Replace the 06D or the CN3?

• Yes Is the RxD of 01C as specified in Figure B-3-4?

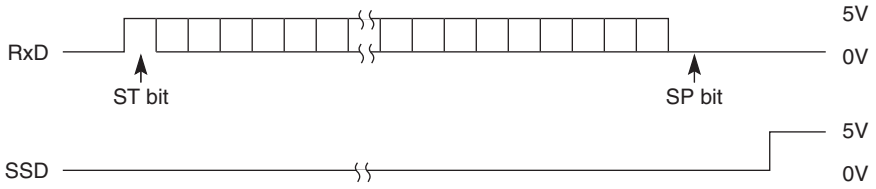


Figure B-3-4

- No Replace the 05D.

• Yes Replace the 01C.

② In receiving by serial interface, printing data is omitted or printing operation is not performed.

- Are RxD and SSD of 01C as specified in Figure B-3-4?
  - No Replace the 05D.
- Yes Are $\overline{WR}$, and BUS signals of 01C pin 28 as specified in Figure B-3-5?

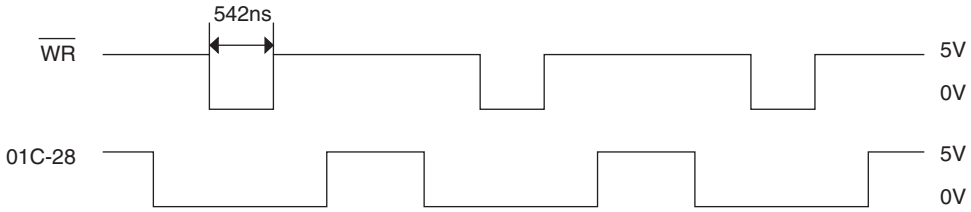


Figure B-3-5

  - No Replace the 01C.
- Yes Is the level of a BUS signals at 02A pins 2-9 the same as that of DATA1-8 when $\overline{WR}$ signal is started?
  - No Replace the 02A.
- Yes Is 10 pin of 04C identical to $\overline{WR}$ signal in Figure B-3-5?
  - No Replace the 04C.
- Yes Check 02B on the Control board.

3.3 Local Test

3.3.1 Circuit test mode

3.3.1.1 Setting

(1) Diagnostic test (DIP-Switch)

(2) Test connector

Connect the test connector shown in Figure B-3-6 to the interface connector.

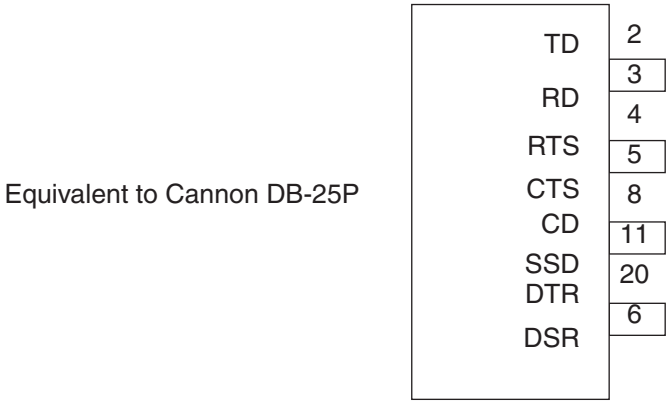


Figure B-3-6 Test Connector Connection Diagram

3.3.1.2 Function

After the settings outlined in Section 3.3.1.1 are completed and power is turned on, the serial interface checks the message buffer memory and interface driver/receiver circuits. It then prints characters.

To start and stop this test, push the SEL switch on the front of the printer.

Details of this test are explained on the following.

(1) The program revision using two numerical characters is printed.

(2) “LOOP TEST” is printed.

(3) Memory is checked for the message buffer.

(4) “OK” is printed if the memory check is OK and “BAD” is printed if the memory check fails.

(5) Output level to DTR, RTS, and SSD signals is dropped low. If DSR, CTS, or CD signals is High, “IF BAD” is printed. If DSR, CTS, and CD signals are all Low, “IF OK” is printed.

(6) Output level to DTR,RTS, and SSD signals is raised high. If DSR, CTS, or CD signals is Low, “IF BAD” is printed. If DSR, CTS, and CD signals are all High, “IF OK” is printed.

(7) Transmits characters codes from 20H to 7FH is transmitted by SD signal. At the same time, characters are received by the RD signal and stored in the message buffer.

(8) The characters that were stored in the message buffer as indicated in (7) are printed.

(9) Steps (1) through (8) are repeated until test is interrupted.